

Future Global Governance for Antimicrobial Resistance

IACG Discussion Paper
July 2018

Disclaimer: This IACG discussion paper is based on a small meeting with some IACG members and external participants from the public, private, and philanthropic sector and further discussions within the IACG. This content is subject to change and is not an IACG consensus document but a summary of the discussions which is now open for wider discussion to inform the IACG recommendations on practical future governance model(s) to the UN Secretary General by Summer 2019.

Key Messages:

- The IACG has agreed within its mandate to propose practical mechanisms for improved global coordination, collaboration, accountability, and governance, among all relevant stakeholders, with the aims of strengthening existing mechanism, maintaining political commitment and ensuring sufficient action is taken;
- A background analysis on the governance needs for AMR and an evaluation of existing and relevant governance models from other areas was commissioned (see *Annex 2*) to inform the IACG and formed the basis for a small meeting in April 2018 of senior representatives from the Tripartite, private sector, and academic and multilateral experts;
- This is a discussion paper and should not be considered a fully comprehensive account of the discussions nor a consensus statement by the IACG but a first step to move the discussions forward;
- At this meeting, consensus was reached that the status quo was not delivering and we must build on and strengthen existing governance mechanisms;
- Ten requirements for effective AMR governance mechanisms emerged and based on the identified needs, the experts together built a draft model for discussion and debate that provides an outline of the possible future global governance of AMR (see *Figure 1*);
- The proposed governance structure considers the requirements for delivery of the long-term ambition for AMR in a sustained way, alongside more immediate short term opportunities to engage stakeholders, mobilise action and address the pressing and complex challenges posed by AMR;
- Initial findings suggested that a future global, multi-stakeholder agreement is urgently needed to provide a sufficient mandate to act in accordance with the needs identified, providing the authority to coordinate resource, engage stakeholders, and secure binding commitment for action;
- The above goal might best be achieved by the development of a multisector, multi-stakeholder Global Steering Board to be hosted in an existing organisation, led by a time-limited High-Level AMR Commission;
- The IACG now wish to socialise their initial findings to inform their work ahead of developing recommendations to the UN SG by summer 2019.

1. Background

The IACG was established by the United Nations (UN) Secretary General in March 2017 with the UN Deputy Secretary General and WHO Director General as co-Chairs to deliver as an “ad hoc Inter- Agency Coordination Group (IACG)” on Antimicrobial Resistance (AMR) mandated by Member States in the political declaration of the High Level Meeting on AMR contained in Resolution A/RES/71/3.

The IACG is mandated to provide practical guidance for approaches needed to ensure sustained effective global action to address AMR. To achieve this, the IACG have committed in their work plan to propose options of mechanisms for global collaboration and coordination among all relevant stakeholders, with the aims of strengthening existing mechanisms and maintaining political commitment to combat AMR. A report with practical recommendations will be submitted by the IACG to the UN Secretary General by summer 2019.

AMR presents the global community with a significant challenge, in terms of depth, breath and complexity. As the threat posed by resistant genes and drug-resistant infections continues to grow, so do calls for a strengthened and formal global governance mechanism(s) to coordinate the response to AMR. The multifaceted, multi-sector and multi-stakeholder nature of the AMR challenge means any approach used to address AMR on the global stage must be carefully considered, and while there is much to be learnt from existing global governance mechanisms a bespoke approach may be the best way forward.

In April 2018, a small group of senior experts from across the world met at Leeds Castle under the auspices of the IACG to deliberate on the future global governance arrangements for AMR. This cross-sector group – with experts drawn from across the AMR field as well as those with wider expertise in governance, global health policy, agriculture, environment, and pharmaceuticals – were tasked with exploring the gaps in how the global community currently addresses AMR as well as the major needs for any governance mechanism going forward. The group were challenged to propose a global governance model(s) for AMR beyond 2019 that fulfilled all the nominated requirements, drawing on governance approaches employed within other global challenges as stimulus (for overarching global AMR objectives see the IACG AMR Framework for Action¹, and *Annex 1* for the analysis of different governance approaches by Sridhar & Woods, *Global Governance of Antimicrobial Resistance – a One Health Approach*). The governance structure drafted considers the requirements for delivery of the long-term ambition for AMR in a sustained way, alongside more immediate short term opportunities to engage stakeholders, mobilise action and address the pressing challenges posed by AMR. The meeting outputs were further discussed at the Seventh meeting of the IACG in May 2018.

This report provides a summary of the conversations and conclusions at the Leeds Castle meeting and the IACG meeting in May, but should not be considered a fully comprehensive account nor a consensus statement but a first step to move the discussions forward. The IACG plans to have further meetings and discussions to progress this work further as they developed their recommendations to the UN Secretary General.

¹ http://www.who.int/antimicrobial-resistance/interagency-coordination-group/20170818_AMR_FfA_v01.pdf

2. What are the needs for practical future global governance of AMR?

To develop a governance model it is first necessary to understand what is required of the system. The experts were asked to consider this question for AMR, identifying the various challenges and gaps posed by the current global situation and from this the needs required of any future governance approach.

In the first instance the experts considered governance needs arising from the animal, environmental and human health sectors of the One Health agenda, creating a view of where there was alignment and where sectors required more specific support.

Shared One Health needs
<ul style="list-style-type: none"> • Stability/certainty • Harmonisation/alignment, adapted based on resource and context (phased approaches where required) • Engagement outside UN system, e.g. private sector, professionals, regulators, civil society • Clear mandate and formalised partnerships • Empowered to negotiate global policies and regulations • Political Leadership • Global representation • Transition support for LMICs • Truly One Health approach • Emphasis on the importance of prevention, diagnosis and alternatives • Improved surveillance across many areas, e.g. antimicrobial use, resistance levels, infections, outcomes • Appropriate access and stewardship, and a sustainable and resilient supply • Mechanisms that brings together innovators, investors and implementers productively • Identify and communicate best practices/improve education • To fully engage with the private sector • Flexibility within global frameworks/policies for adaption to national systems • Focus on patient/prescriber level interactions
Specific sector needs
Animal/Agriculture/Aquaculture/ Food <ul style="list-style-type: none"> • Global standards/regulations to provide a level playing field • Support (research, funding, technical and infrastructure) to adapt processes in low resource settings • Focus on the development of affordable alternatives to antibiotics across all species and settings • Consistent strategic approach that is supportive of trade and sector business models • Precautionary but pragmatic approach
Environment <ul style="list-style-type: none"> • Mechanism to set global consensus on standards • Application of precautionary principal in short-term whilst evidence base is established • Research to understand the relative contributions of different sources of contamination • Better representation of sector in global conversation • Engage regulators (drugs, water standards, etc.) as well as industries (drugs, high-use facilities, sewage, hospitals, run-off agriculture/food production)
Human health <ul style="list-style-type: none"> • Finding mechanisms to address the restrictions imposed by the WHO Framework of engagement with non-State actors (FENSA).

Bringing these discussions together, a set of minimum requirements for an effective AMR governance mechanism emerged. While other additional qualities were raised, it was agreed that any new AMR governance system must:

1. Have a clear mandate to elevate global action on AMR across human and animal health, agriculture, food, and environment, supporting the translation of this action to the national level.

A clear One Health mandate is central to any effective governance mechanism, supporting the case for prioritisation and rapid action on AMR nationally, regionally, and globally, as well as facilitating engagement with key stakeholders across the system and enabling bold action in motivating and mobilising global communities. This mandate requires backing from senior leadership across all sectors, calling for AMR to be considered as ‘core business’ and holding Member States to account.

2. Engage stakeholders from across the AMR system to ensure both a global and true One Health approach, focused on delivery which recognises resource/context needs.

Any viable governance mechanism must bring all AMR stakeholders to the table, engaging with Member States, ensuring representation and involvement of Low and Middle Income Countries (LMICs) by including these voices at every level; the human, animal and environmental aspects of AMR to align with the One Health agenda; industry/private sector, professional groups, regulators and civil society to ensure cross-sector discussions and implementation. The mechanism(s) must play a key role in convening different groups to enable more effective action on AMR. An example could be, providing a trusted global forum for funders, innovators, and implementers to engage early in product development life cycles across One Health, where appropriate.

3. Provide sufficient flexibility to be inclusive of different nations and sectors, recognising that while we all have the same goals we will start from different points, are driven by different incentives, and need different approaches to get there.

Flexibility is a core element of any future governance mechanism, providing sufficient room for AMR actors to work under the appropriate framework for addressing AMR in their specific context. This will be key to addressing AMR at country level and will also be vital when thinking both across and within sectors – the animal sector requiring very different targets, incentives, and initiatives to the human sector, and even within the animal sector different livestock divisions requiring their own specific approaches and solutions. This flexibility would allow space to join the process at different starting points, setting realistic goals and implementing tailored interventions.

4. Secure binding global commitment for action, with accountability clearly assigned at every level.

To ensure prioritisation of this issue, binding commitments would be required at national, regional, and global levels. This, along with strong leadership and political buy in, would place accountability for progress on AMR with individual countries. Accountability across the structure and AMR system as a whole will be vital to secure change, placing responsibility for action with countries at the heart of the AMR challenge supported by the tripartite and UNEP.

5. Integrate with the wider global development agenda to better align on and mobilise actions that create common good.

It is clear that many objectives for addressing AMR would also provide wider public good, particularly across the sustainable development agenda. Without aligning AMR action the Sustainable Development Goals (SDGs) are put at risk, while there is opportunity to garner greater support for activities that have a positive impact on AMR. For example, programmes that facilitate access to quality-assured antibiotics and products along with improved stewardship and education/training within Universal Health Coverage (UHC).

6. Building on current structures wherever possible so as not to ‘re-invent the wheel’ and offer simplicity and sustainability while still respecting the complexity of the AMR challenge.

While the AMR system is complex and wide-ranging it will be important to maintain simplicity and build on progress to date. The existing Tripartite provides an important starting point, expanding it further to include environmental concerns while also formalising and strengthening the relationship between its core organisations is essential. At the national level, any governance structure should support coordination and reduce duplication, ensuring good practice is shared and celebrated while recognising solutions may be context specific.

7. Generate evidence-based targets and aligned tasks, supported by transparent multidimensional metrics and indicators, to identify a clearer way forward.

While overarching global goals for AMR have been defined in the GAP and explained in the IACG Framework for Action on AMR, any AMR governance structure should facilitate development of evidence-based targets to help global actors in understanding what success looks like on the ground. These must be supported by clear metrics for evaluating progress, harmonising existing indicator mechanisms where available. Targets and corresponding tasks must be multidimensional and prioritised, as well as appropriately adjusted to resource setting. The governance structure also needs to assure a global mechanism to regularly monitor overall progress and periodically revisit ambition as further evidence emerges.

8. Be a credible and respected voice, synthesising evidence and adding weight to global negotiations.

Any governance structure for AMR should have sufficient credibility to be globally respected as an authoritative voice on all aspects of the AMR challenge. Effective AMR governance should also be independent, and empowered to make recommendations that are acted on where needed. This would allow the structure to be fully effective in its potential roles offering advice to AMR actors from all sectors and providing support in global negotiations. The governance mechanism should be an adjudicator of the knowledge base, interrogating and synthesising evidence from a ‘whole sector’ view to identify ongoing knowledge gaps and support research. This must be done through the engagement of expert advisors from broader than the AMR system, employing a system for expert input such as the Intergovernmental Panel on Climate Change (IPCC) Working Group model.

9. Harness communication to present a more compelling case for action, recognising the needs of different audiences from public to policy.

Effective framing of the AMR challenge is required to create a more compelling case for prioritisation and action as well as convincing sectors/actors yet to be involved in AMR of

their role, this could be achieved through: harnessing the financial case for action (and the price of inaction) to persuade stakeholders influenced by economic impact; and moving towards a positive frame, convincing stakeholders that there is much we can do to create change rather than dissuading them from action through emphasis on the intractability of the AMR problem. There is also further work to be done to better communicate and engage, particularly with lay audiences.

10. Have the means to harness and create change, securing and more effectively organising sufficient funding and resourcing to implement and deliver AMR transition initiatives.

Any governance structure should take a role in moving activity on AMR from discussion to implementation, coordinating activities that change practice on the ground. For example, setting standards, influencing regulation, strengthening surveillance systems, supporting capacity building, and supporting pilot programmes. This would require dedicated funding and resourcing to provide sustainability to the programme, as well as robust co-ordination to avoid duplication of effort. This position will also require the governance structure to take a role in generating evidence on potential interventions, evaluating trade-offs, adapting solutions to country needs and taking a stance on the need for precaution when evidence is still being collated.

3. Proposed global governance model for AMR

Based on the identified needs, the experts together built a ‘straw man’ model for discussion and debate that provides an outline of the possible future global governance of AMR. This model is comprised of a preliminary set of recommended functions as well as a suggested structure.

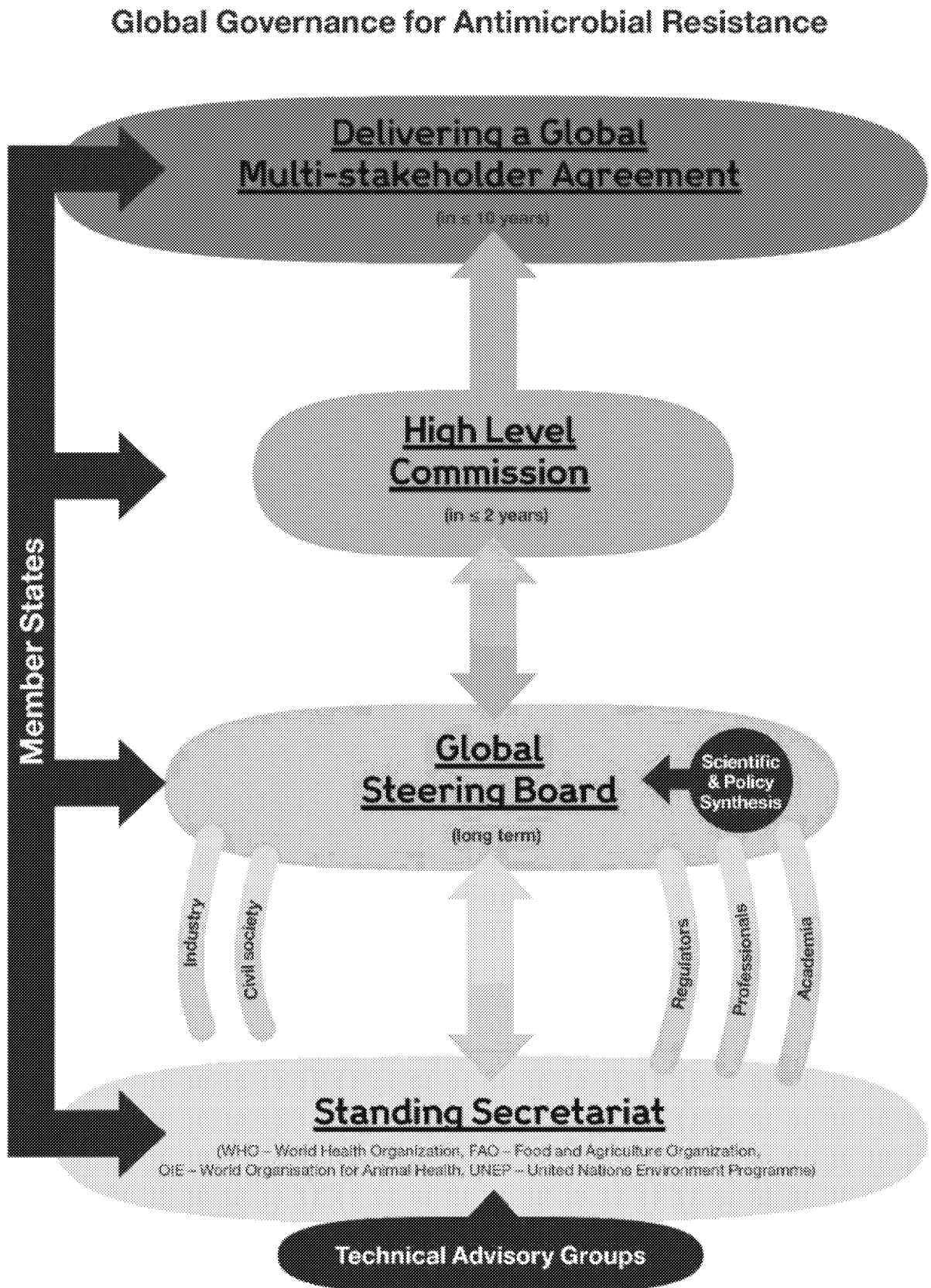
Overall, the experts agreed that the ultimate goal of the governance structure should be the **delivery of a global, multi-stakeholder agreement** – such as a treaty – within the next 10 years. It was felt that only this kind of high-level political agreement would provide sufficient mandate to act in accordance with the needs identified, providing the authority to coordinate resource, engage stakeholders and secure binding commitment for action. This proposed governance model (see Figure 1) comprises the elements that experts felt necessary to deliver this kind of agreement and provide ongoing support for it in the longer-term.

3.1 Model structure

The foundation of the proposed governance structure is grounded in a partnership between WHO, FAO, OIE and UNEP, building on and strengthening the current tripartite. Recognising that no one of these organisations holds a mandate for work across the entire AMR sector, nor do they have sole responsibility for addressing AMR on the global stage, additional groups and stakeholders have been added to the complete structure (Figure 1).

It should be noted that the initial proposal is for the governance structure to be anchored in a Global Steering Board. Recognising that the present IACG is a temporary body until 2019, opportunities should be sought to build support for such a board – potentially through structures like the G20 – so it could act independently and ensure it is sufficiently resourced to deliver.

Figure 1: A proposed structure for the future global governance of AMR



3.2 Model function

Functions mapped against each structural element of the proposed governance model have been developed to ensure all the identified needs are met within the structure, while ultimately contributing to the high-level objective of delivering a global multi-stakeholder agreement on AMR. It is expected that every level of the structure will engage with national and regional policy-makers – particularly ensuring engagement with LMICs – and The Board, Commission and Global Multi-stakeholder Agreement will all span the One Health agenda.

The functionality of the different structural elements of the model to deliver immediate and sustained activity on AMR were suggested as follows:

High Level Commission – a time limited group of no more than 10 heads of state and senior directors from other sectors. Commission objectives being to:

- Build enduring global agreement on AMR
- Provide high level advocacy and keep AMR on the political/heads of state agenda
- Integrate AMR into the SDGs and successor systems

Global Steering Board – a multisector, multi-stakeholder and sustainably resourced group who will:

- Advocate for action (including with tripartite) and country support (technical and financial) and R&D, monitor progress, challenge targets, provide steer on course correction and embed AMR as ‘business as usual’
- Sustain momentum
- Engage with Member States, private sector, civil society, professionals and philanthropy, connecting across sectors and boundaries, including with other UN and International bodies such as the World Bank, Global Fund, GAVI and others
- Ensure regular publication of Scientific and Policy Synthesis reports to provide an accessible overview of the current AMR knowledge base from a One Health perspective. Synthesis should include scientific and socio-economic views on incidence of AMR, its impact on human health, animal health and global food production, and on available options for mitigating and adapting to AMR, including policy options. This reporting function should be independent and also provide, on request, scientific, technological and socio-economic advice to the High-Level Commission
- Convene approved cross-sector working groups to deliver One Health solutions taking into account the different incentives of sectors to take action
- Oversee integrated solutions for new products, sustainable supply, equitable and optimal access, quality-assured
- Not to replicate the tripartite mandate but support to ensure Global Action Plan (GAP) delivery and country ownership.

Standing Secretariat – an expanded and formalised group based on the existing tripartite of the WHO, FAO (and Codex Alimentarius) and OIE, with the addition of UNEP to encompass the entire One Health remit of the AMR challenge. This secretariat will:

- Agree a formal memorandum of understanding between this group
- Leverage formal and coordinated funding
- Ensure, through structured working, a comprehensive One Health approach to AMR including effective technical leadership and support and advice for Member States
- Make use of technical advisory groups of the secretariat organisations.

Wider stakeholders who must be engaged within this structure include **Civil Society, Professionals (human, environment, veterinary, agriculture, and food), Industry/Private Sector, Academia and Regulators**. These groups take on a variety of roles, from engaging and educating on optimal use of quality assured products to encouraging innovation for better disease prevention, diagnostics and treatment across the One Health spectrum.

4. Conclusions

Despite the ambitious objectives posed by this meeting – convening a diverse, cross-sector group to reach a point of agreement on the needs and mechanisms for governing a complex global challenge – significant progress has been made on developing a robust starting point for wider community dialogue. Through the IACG process we are rapidly approaching a critical turning point in how the global community addresses AMR going forward, and this first draft of a governance model put forward will provide a valuable input into the further and more in depth discussions of IACG ahead of their report to the UN Secretary General in summer 2019. Some wider considerations and future opportunities also emerged from the discussion and are outlined in *Annex 1*.

Annex 1: Wider Considerations and Opportunities Identified

a) Wider considerations

In addition to the proposed governance model, a set of wider recommendations emerged from the meeting discussions which the IACG will consider further when developing the final recommendations to the UN Secretary General. These include:

- **Widen the tripartite to include the United Nations Environment Programme (UNEP)**

The existing tripartite lack a mandate to act on environmental aspects of the AMR challenge, and as such should be strengthened through the addition of the specialist organisation.

- **Strengthen and formalise the relationship between WHO, FAO, OIE and UNEP via agreement of a Memorandum of Understanding**

It was agreed that the position of the tripartite could be further strengthened through formalisation of the relationship between its members. This could be achieved through a Memorandum of Understanding, complemented by a joint strategic delivery plan and agreement of an overarching funding mechanism – for example, a membership fee – to ensure sustainable delivery of action to address AMR.

- **Define AMR as an outcome in the country plans developed under UN Development Assistance Frameworks (UNDAFs)**

It was felt that explicit inclusion of AMR in country plans would be a great opportunity to facilitate action on AMR in country through existing networks. This initiative should be supported by the United Nations Development Group (UNDG).

b) Identified opportunities

Recognising that it could take some time to agree and finalise a full global governance structure for AMR, experts also identified several opportunities for more immediate action and cooperation for the IACG to consider as part of their ongoing work. These opportunities include:

- **IACG to consider feasible actions that can be achieved over the next year which will provide the groundwork to secure delivery of a governance mechanism and strong treaty**

Part of the mandate of the IACG is to prepare actions and recommend a practical future global governance model for AMR. The IACG in this report are publishing their early thinking to develop the ideas further and for all to share in the responsibility for delivery. The IACG recognise the central role played by the tripartite in supporting countries and their strengthening relationship with UNEP and will build on this going forward.

- **A ‘pitch’ for AMR**

The experts agreed there was a clear need to develop a stronger narrative and communications strategy – and potentially a more accessible name – for AMR. It was suggested that an AMR ‘pitch’ could be developed, with the goal of better framing the

AMR challenge to galvanise support from political leaders, the wider UN system, and leaders across different sectors. Actions to initiate this project could be:

- Framing of AMR as a development issue, with a view to working towards sustainable access to antimicrobials (i.e. Universal Health Coverage alignment)
 - Further work shaping AMR goals to secure political support
 - Convene a small expert working group to discuss needs and opportunities
- **IACG to consider establishing a special representative role**
The role of prominent champions in garnering wide-ranging support for AMR emerged as a significant gap. Recognising that the UN Secretary General is not minded to establish additional Special Envoys, it was suggested that consideration is given to establishing a champion for AMR (through a special representative).

To maintain momentum generated at this meeting, a number of near-term touch points were identified where these experts as well as a broader set of experts could be further consulted on future governance for AMR. These include:

- **Consensus building opportunities (including, but not limited to)**
 - G77 – Egypt (2018) presidency, and the South Centre
 - G20 – support via the Argentinian (2018) and Japanese (2019) presidency
 - G7 – support via the Canadian (2018) or French (2019) presidency
 - High Level Political Forum (HLPF) on Sustainable Development (annual event, July 2018)
 - UNGA 2018 – potential to reconvene the Leeds Castle meeting participants and link into the TB high level meeting
 - The UN AMR Group of Friends in NY established at the HLPF in July 2017
 - The Alliance of Champions on AMR established in 2015.
- **Specific stakeholder engagement opportunities which the IACG may wish to take forward (including but not limited to)**
 - World Bank Annual Meeting, October 2018 – opportunity to discuss proposed governance model with a different group of stakeholders
 - Proposed WEF industry forum at UN General Assembly – an offer has been made to host a forum to discuss options for global governance
 - World Health Assembly, OIE General Assembly, FAO biannual meeting and the UNEP General Assembly.

Global Governance of Antimicrobial Resistance – a One Health Approach

Background report to inform IACG Discussions

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Executive Summary

Antimicrobial resistance (AMR), particularly resistance to antibiotics, poses grave risks which no country can avoid without global collective action. Enhancing global governance has become imperative and is necessary to preserve the global commons of antibiotics and other antimicrobials. The drivers of AMR lie in humans, animals, agriculture (including crops and aquaculture), and in the environment. Yet at present each of these issues is dealt with in a separate institution in global governance.

Unfortunately, the rising threat of AMR in humans is neither new nor rare. Drug resistant infections are estimated to currently cause 700 000 deaths each year around the world.² Driving this resistance is a complex collection of human activity through antimicrobial exposure in healthcare, agriculture (including aquaculture and crops), and the environment thereby threatening global health, livelihoods, and food security.³

The costs of not dealing with AMR could lead to an annual reduction of global GDP of 3.8% by 2050 as costs of providing healthcare, treating disease, and preventing infections rise.⁴ Set to be hit hardest are resource-constrained countries leading to increased poverty and inequality.⁵ Together, these realities threaten the attainment of various Sustainable Development Goals (SDGs) including those on poverty reduction, reduced inequalities, clean water and sanitation, and more. Important to note alongside AMR is a larger problem of equity and access. While the use and overuse of antimicrobials – particularly antibiotics – leads to resistance that takes human lives, in many countries, the lack of access to and unaffordability of antimicrobials leads to an even higher mortality burden than resistance itself – while 700 000 deaths are thought to be taken by AMR, some 5.7 million deaths are the result of a lack of access to antibiotics yearly.^{6,7}

To date, agriculture has attracted less attention in debates about AMR. Yet the trend towards increasing use of antibiotics in livestock rearing, crop production, and aquaculture highlight that action needs taking in agriculture as well as in respect of human health and the environment. The broadly acknowledged lack of scientific evidence and paucity of data is not evidence for no action. Indeed, analysis of previous international agreements that were based on the ‘precautionary principle’ suggest that the time for global governance for AMR is now and provide lessons for agreeing on an ideal path forward. Policies will need to allow for some flexibility to account for local contexts to receive broader support, financial and technical assistance will be required to assist developing country parties, and an ongoing

² Myers, J. (2016). ‘This is how many people antibiotic resistance could kill every year by 2050 if nothing is done.’ *World Economic Forum*, 23 Sep. Available from: <https://www.weforum.org/agenda/2016/09/this-is-how-many-people-will-die-from-antimicrobial-resistance-every-year-by-2050-if-nothing-is-done/> [Accessed 22 March 2018].

³ Holmes, A.H., Moore, S.P., Sundsfjord, A., Steinbakk, M. et al. (2016). Understanding the mechanisms and drivers of antimicrobial resistance. *Lancet*. 387, 176-87. doi: 10.1016/S0140-6736(15)00473-0.

⁴ World Bank. (2016). *Drug-resistant infections: a threat to our economic future (discussion draft)*. World Bank. Available from: <http://pubdocs.worldbank.org/en/527731474225046104/AMR-Discussion-Draft-Sept18updated.pdf> [Accessed 10 March 2018].

⁵ Ibid.

⁶ Jasovský, D., Littmann, J., Zorzet, A. & Cars, O. (2016). Antimicrobial resistance—a threat to the world’s sustainable development. *Uppsala Journal of Medical Sciences*. 121(3), 159-164. doi: 10.1080/03009734.2016.1195900.

⁷ Jasovský, D., Littmann, J., Zorzet, A. & Cars, O. (2016).

technical advisory group can be developed to appraise evolving evidence and support decision-making on complex matters.

Several major international reports, and the experience of the European Union (EU), point the way forward. They all agree on the need for a global approach which is adequately funded and brings different sectors together, increases advocacy, and optimal antibiotic access and use. Surveillance and monitoring as well as research and development into AMR, and innovations and alternatives to antibiotic use (in both human and agricultural use) and stewardship of new and existing antibiotics are equally necessary. But several barriers stand in the way, including: gaps in data, a lack of scientific agreement, private interests with little short-term incentive to alter behaviour or to accept higher regulatory standards; variations in national capacity/capability to participate in a global compact, and other powerful pressures to maintain the status quo. Meanwhile, people are dying from previously preventable causes and resistance levels continue to rise.

Building on commitments already made in the UNGA, G20, G7, the tripartite (WHO, FAO, OIE) and the One Health GAP on AMR, and bringing to bear the experience of global governance in other areas, this paper lays out some scenarios for enhanced global governance.

A global forum of some kind is seen as essential to enable stakeholders to:

- (1) Convene negotiations and set global standards and targets in human health, agriculture, and the environment, such as: in agriculture, phasing out of the use of antimicrobial growth promoters (as the EU has done); in health, reducing counterfeit and substandard medicines; and on environmental contamination restricting antibiotic effluents from pharmaceutical manufacturing, agricultural operations, and hospital waste.
- (2) Conduct surveillance and monitor progress towards goals, including: (i) antibiotic use in health and agriculture, and prevalence in effluent, (ii) resistance levels and infections locally, nationally, and internationally, (iii) antimicrobial production, sales, use across sectors and within sectors should all be a key part of a global approach. Many countries will need support to build the capacity to do this (as the experience of GLASS and the OIE demonstrates).
- (3) Build norms and public knowledge of the true scale of AMR and the economic consequences for households, health systems, and national economies, creating campaigns where necessary (the “galvanizing the groundswell” movement on climate change offers an example).
- (4) Finance alternatives and innovations such as new vaccines, diagnostics (to permit cheap and rapid tests which would correct over-use), and therapies for both humans and animals through a pooled fund (such as GAVI). In the first instance, survey the current landscape of funding for AMR including what is being funded in AMR sensitive or specific activities, by whom, and how much.
- (5) Collaborate with the private sector (particularly pharmaceutical and agricultural companies) where possible, since their expertise, resources, interests, and information could ensure more effective and rapid implementation and enforcement.

(6) Ensure accountability to consumers and citizens who will be vital drivers of change. Reporting clearly on actions and progress would permit them to mobilize to ensure real change occurs (such as consumer organizations have done in the US and the EU)

Three models for delivering on these elements strike us as offering potential.

A first is a **corporate voluntary code of conduct on AMR** agreed by the industries involved (pharmaceutical companies, healthcare providers, agriculture producers). This would build on a willingness already demonstrated by some parts of industry. It could leverage corporate leaders with a particular interest in reputation and consumers' concerns (such as Perdue Farms, who have phased out the use of antibiotics in their production), as well as corporations who themselves are consumers of the industries listed above, such as McDonald's, Subway, and Chick-Fil-A, and finally, corporations who wish to "level the playing field" such the fast food chain KFC which overcame its opposition to amending its antibiotics policy when other companies' standards and activist pressures began to impact its business model. KFC now has an incentive to work toward industry wide regulation to get their competitors to adopt similar standards.

This approach would have to overcome three weaknesses evident in corporate self-regulation in other sectors. First, "regulatory forbearance" must be avoided so that parties do not sign up to voluntary regulatory measures precisely because they know their inaction in respect of commitments will not be monitored or enforced (eg in the first phase of the Responsible Care Code). Second, the monitoring or auditing of actions taken must be robust and trustable (unlike the case in apparel manufacturing where auditors failed to uncover the most obvious breaches). Finally, a global approach to AMR will need to include other stakeholders including public sector bodies, doctors, patients and consumers.

A second scenario is **multi-stakeholder protocol** (in the style of the Montreal Protocol), which would be negotiated by governments, research scientists (human health, agriculture, and environment), and major agricultural and pharmaceutical companies. The forum could be the United Nations, or the World Economic Forum (which now has formal status as an International Organization), or a new Swiss Foundation with the World Bank as the fiduciary agent, similar to the Global Fund to fight AIDS, TB and Malaria. The parties could agree specific science-based targets for reducing the release of antibiotics into the environment, reducing uncontrolled antibiotic purchases, ending the use of antibiotics for growth promotion purposes in aquaculture, farming, and agriculture. An Implementation Fund could be created to provide financial and technical support for developing countries.

The accurate monitoring and surveillance of commitments could be undertaken by the parties themselves, by a designated international organization, or by a consortium of the implementing agencies (e.g. WHO, FAO, OIE, World Bank, OECD) reporting to the parties on an annual basis. Equally, countries could report their own progress within the SDGs framework on progress towards the specified targets, while firms report their progress through their annual reports and joint industry declarations.

A third scenario is an **inter-governmental treaty** agreed strictly among governments (as per the Framework Convention on Tobacco Control or FCTC). An AMR treaty would have government signatories commit to establish essential infrastructure for AMR reduction, including adopting a national coordinating mechanism, national strategies and targets, enacting legislation, and protecting the regulatory system from private sector lobbying (e.g.

of the agricultural and pharmaceutical industries). The burden of compliance would fall to each AMR signatory. Governments would have to enforce targets (such as those mentioned in the Protocol above) nationally.

The global forum could be the Conference of the Parties (COP), not unlike the AMR Protocol scenario, and could be supported by a secretariat which would collate global progress reports and maintain a global database. Equally, it could be supported by an implementation fund as above. Monitoring and surveillance would be done by national governments who would (under their treaty obligations) share information, promote information exchange, and report to the secretariat at least annually/biannually.

Regardless of the governance model selected and developed in the future, it will be important to develop and propose necessary accountability mechanisms which monitor the implementation of global governance for AMR and inform the future work of the Interagency Coordination Group (IACG) on AMR who will report on progress and develop recommendations to the UN Secretary General in early summer 2019. Finally, the importance of ways in which AMR progress can be tracked, including the symbiotic relationship between the existing SDG framework and the global governance of AMR, should be incorporated into the roadmap to AMR governance to support broader development goals.

1. The drivers of Antimicrobial Resistance are human health, agriculture and animals, and environmental contamination

The process of AMR – which refers to when antimicrobial drugs that normally help remove a microorganism (bacteria, viruses, parasites, or fungi) from the body stop working due to changes of the microorganism – is a natural evolutionary phenomenon for microorganisms that are constantly adapting to survive.⁸ While resistance to all antimicrobials are important, antibiotic resistance is of particular concern given that it is the greatest contributor to global risk and the limited selection of antibiotics available.

Antibiotics and other antimicrobials are an essential tool for preventing morbidity and mortality in humans and animals. Since the 1920s, antimicrobials have become increasingly used as life-saving treatments for infectious diseases in humans and are now used for treatment and even prevention of disease.⁹ Similarly, in animals, antibiotics are widely used in animal feed to prevent infections and treat diseases as they are in humans.^{10,11}

In the 1940s and 1950s, it was discovered that low doses of antibiotics could promote and optimize growth in animals leading to new functions in the agricultural sector – namely marginal improvements of growth promotion and for the supplementation of good animal husbandry, in addition to biosecurity measures.^{12,13,14} Though use in both human health and agriculture exists, use in human health is thought to be the greatest contributor to AMR although agriculture is thought to follow closely behind – both of which lead to antimicrobial environmental release, which itself is a contributor to resistance.¹⁵ In both humans and animals, injudicious use and misuse, poor drug quality, limited regulations, poor surveillance and monitoring, and suboptimal user behaviours all magnify the threat of having these essential medications lose their effectiveness.¹⁶

(a) Antimicrobial use and human healthcare

In human health, as antimicrobial use grows in consumption and as the predicted use of antibiotics is set to increase as access expands, increased attention is needed to ensure that they are used only when essential. Prevention of infection, such as through proper sanitation and infection control, remains a global challenge that itself causes bacteria to spread, eventually contributing to AMR. However, it is not the only problem. Up to 50% of all

⁸ World Health Organization (WHO). *Antimicrobial resistance*. Available from: www.who.int/mediacentre/factsheets/fs194/en/ [Accessed 22 March 2018].

⁹ CDC. (2017). *About antimicrobial resistance*. Available from: <https://www.cdc.gov/drugresistance/about.html>. [Accessed 13 March 2018].

¹⁰ Marshall, B.M. & Levy, S.B. (2011). Food animals and antimicrobials: impacts on human health. *Clinical Microbiology Reviews*. 24(4), 718-733. doi: 10.1128/CMR.00002-11.

¹¹ McEwen, S.A. & Fedorka-Cray, P.J. (2002). Antimicrobial use and resistance in animals. *Clinical Infectious Diseases*. 34 (3), S93-106. doi: 10.1086/340246.

¹² Marshall, B.M. & Levy, S.B. (2011).

¹³ Haihong, H., Cheng, G., Iqbal, Z., Xiaohui, A. et al. (2014). Benefits and risks of antimicrobial use in food-producing animals. *Frontiers in Microbiology*. doi: doi.org/10.3389/fmicb.2014.00288.

¹⁴ O'Neill, J. (2015).

¹⁵ Holmes, A.H., Moore, S.P., Sundsfjord, A., Steinbakk, M. et al. (2016).

¹⁶ Ayukekbong, J.A., Ntemgw, M. & Atabe, A.N. (2017). The threat of antimicrobial resistance in developing countries: causes and control strategies. *Antimicrobial Resistance & Infection Control*. 6, 47. doi: [10.1186/s13756-017-0208-x](https://doi.org/10.1186/s13756-017-0208-x).

antimicrobials are considered unnecessary with prescribing occurring in both hospital and community settings.¹⁷ In many cases, especially in resource-constrained environments, prescriptions are not even needed for access to antimicrobials; instead, they are unregulated and available over-the-counter at walk-in pharmacies and stores making them easily available, plentiful, cheap, and ripe for overuse.¹⁸ In other cases – even in countries with strong regulations – access to these medications are available online without a prescription.¹⁹

Usage varies across nations and is rapidly changing. While overuse is common across many nations, rising use in countries such as India, China, Brazil, South Africa and Russia (BRICS) accounts for 76% of the overall increase in antibiotics between 2000 and 2010, with India and China in particular being large contributors.²⁰ The combination of overprescribing and unregulated use are driven by government, market and health care system failures; regulatory laxity, financial incentives, often misguided pressure to use antibiotics from patients, and a desire to be on the “safe side”. Across regions, including in Europe, usage rates vary and are not just an outcome of economic growth – norms, practices, policy and various other factors are likely to explain different patterns of use.²¹ Interestingly, rates of antibiotic consumption in low- and middle-income countries are rapidly reaching that of high income countries and account for the majority of the rise in use between 2000 and 2015 even though appropriate access to necessary antibiotics in many of these countries is still an unachieved reality.²²

Moreover, when these medications are ultimately procured, they are often of counterfeit or substandard quality in many resource-constrained countries, which itself contributes to increased resistance rates, prolonged infection rate, and potential for further spread.²³ 10% of medical products in developing countries is substandard or falsified; antibiotics and antimalarials are the most commonly reported.²⁴

(b) Antimicrobial use and animals

Antimicrobials are widely used in animal (including aquatic) feed to prevent infections and treat diseases as they are in humans.^{25,26} They are also used in crop production, but only 0.2-

¹⁷ Holmes, A.H., Moore, S.P., Sundsfjord, A., Steinbakk, M. et al. (2016).

¹⁸ Ventola, C.L. (2015).

¹⁹ Ibid

²⁰ Laxminarayan, R. & Chaudhury, R.R. (2016). Antibiotic resistance in India: drivers and opportunities for action. *PLoS Medicine*. 13(3): e1001974. doi: 10.1371/journal.pmed.1001974.

²¹ Klein, E.Y., Van Boeckel, T.P., Martinez, E.M, Pant, S. et al. (2018). Global increase and geographic convergence in antibiotic consumption between 2000 and 2015. *PNAS*. Not printed. doi: doi.org/10.1073/pnas.1717295115.

²² Klein, E.Y., Van Boeckel, T.P., Martinez, E.M, Pant, S. et al. (2018). Global increase and geographic convergence in antibiotic consumption between 2000 and 2015. *PNAS*. Not printed. doi: doi.org/10.1073/pnas.1717295115.

²³ Kelesidis, T & Falagas, M.E. (2015). Substandard/counterfeit antimicrobial drugs. *Clinical Microbiology Reviews*. 28(2), 443-464. doi: [10.1128/CMR.00072-14](https://doi.org/10.1128/CMR.00072-14).

²⁴ WHO Global Surveillance and Monitoring System for substandard and falsified medical products. Geneva: World Health Organization; 2017. Licence: CC BY-NC-SA 3.0 IGO [cited Apr 16 2018] available from: http://www.who.int/medicines/regulation/ssffc/publications/GSMS_Report.pdf?ua=1

²⁵ Marshall, B.M. & Levy, S.B. (2011). Food animals and antimicrobials: impacts on human health. *Clinical Microbiology Reviews*. 24(4), 718-733. doi: 10.1128/CMR.00002-11.

²⁶ McEwen, S.A. & Fedorka-Cray, P.J. (2002). Antimicrobial use and resistance in animals. *Clinical Infectious Diseases*. 34 (3), S93-106. doi: 10.1086/340246.

0.4% of total agricultural antibiotic consumption is crop-related.²⁷ Nevertheless, their contribution to AMR cannot be ignored. In animals such as chicken or cattle, it is clear that when fed antimicrobials, the rise of resistant organisms among them is an expected outcome.^{28,29} Perhaps more worrisome is the evidence supporting the transmission of these resistant organisms from animals to human beings – be it through direct contact, environmental exposure, or food consumption.^{30,31} One prime example of this has been the emergence of a new form of Colistin-resistance among pigs in China that was then found to be present among human hospital patients in the same region and now world wide – given that Colistin is a last-resort antibiotic, this potential case of resistance transferring from animals to humans is particularly concerning.³² Other studies in various contexts provide further support of the possibility of transfer of resistant bacteria to humans finding animals or the food chain to be a risk factor for resistant strains of infection.^{33,34} Even if such evidence for animal to human transmission did not exist, the fact that simply feeding animals antimicrobials leads to new resistance patterns in genes, organisms, and in the broader environment itself is a major threat for future infectious potential.

Another potential contributor to AMR is the use of antimicrobials in pet animals for treatment and prophylaxis. Though the amount used in pet animals is significantly lower than in agriculture, human proximity to pets and the ease of transfer of resistant bacteria, resistant or not, make pet contributions to AMR worrisome.³⁵

(c) Antimicrobial use and the environment

Resistant genes are known to be released into the environment that originate from human and animal waste, and when these co-exist with antimicrobials that are also present, further novel combinations of resistance genes can be selected for that pose a threat to human and animal health; however, the process of this reality is poorly understood.^{36, 37} The environmental pollution of antibiotics may also be problematic, such as in hospital and pharmaceutical manufacturing plant effluent where thousand-fold blood level concentrations of antibiotics have been found. Other resistance-driving chemicals such as other antimicrobials, heavy

²⁷ O'Neill, J. (2015).

²⁸ Hoelzer, K., Wong, N., Thomas, J., Talkington, K. et al. (2017).

²⁹ Ibid.

³⁰ Institute of Medicine. (2012). *Improving food safety through a One Health approach*. Washington, DC, The National Academies Press. Available from: https://www.ncbi.nlm.nih.gov/books/NBK100665/pdf/Bookshelf_NBK100665.pdf [Accessed 10 March 2018].

³¹ Wall, B.A., Mateus, A., Marshall, L. & Pfeiffer, D.U. (2016). *Drivers, dynamics and epidemiology of antimicrobial resistance in animal production*. Food and Agriculture Organization (FAO). Available from: www.fao.org/3/a-i6209e.pdf [Accessed 10 March 2018].

³² Liu, Y., Wang Y., Walsh T.R., Yi, L. et al. (2016). Emergence of plasmid-mediated colistin resistance mechanism MCR-1 in animals and human beings in China: a microbiological and molecular biological study. *Lancet Infectious Diseases*. 16, 161-168. doi: 10.1016/S1473-3099(15)00424-7.

³³ Gupta A., Fontana J., Crowe C., Bolstorff B. et al. (2003). Emergence of multidrug-resistant *Salmonella enterica* serotype newport infections resistant to expanded-spectrum cephalosporins in the United States. *Journal of Infectious Diseases*. 188 (11), 1707–1716. doi: 10.1086/379668.

³⁴ Hoelzer, K., Wong, N., Thomas, J., Talkington, K. et al. (2017)

³⁵ O'Neill, J. (2015).

³⁶ Ibid.

³⁷ Ibid.

metals, bioicides, and solvents are also important to consider as they are known to disrupt the environment for microbes and contribute to selection for resistance genes.^{38,39}

As genes transfer among organisms and as their presence spreads and changes as they move through various parts of the environment, they are exposed to conditions that can amplify these genes and create new and novel forms. However, the evidence on the relationship between various factors making up these conditions and the rise of resistance is not well delineated. Like in human health and agriculture, the presence of antimicrobials in the environment requires dealing with but due to the paucity of evidence in this area, steps for action are expectedly unclear.

(d) Determining the priority factors for addressing AMR

In tackling AMR, the aforementioned drivers are clear contributors to resistance that need to be addressed, but which is most important?

Due to the lack of unequivocal data, a clear consensus is hard to achieve.⁴⁰ Gaps in data exist because parameters operate in the same space, making causal identification of contributions difficult. For instance, in human health, the type of microorganism, the host factors, mutation rates, and interactions between the organism and its environment influence resistant rates while other factors such as healthcare system dynamics, drug access, and drug quality factor into the contextual mix.⁴¹ In agriculture and animals including fish, the composition of surrounding microbes in the environment, the organism being considered, the antimicrobial and its dosage being used, previous exposures, and other factors similarly complicate delineations from research.^{42,43*} Nevertheless, some evidence accompanied by expert consensus suggests that human health practices are perceived to have the highest impact with animal and agricultural practices following close behind – inappropriate antimicrobial use in both sectors is the major driver.^{44,45,46}

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ Katrime Integrated Health. (2016). *The role of human health and animal health in antimicrobial resistance*. NCCID. Available from: <https://nccid.ca/publications/role-human-health-animal-health-antimicrobial-resistance/> [Accessed 13 March 2018].

⁴¹ Ibid.

⁴² Ibid.

⁴³ Holmes, A.H., Moore, S.P., Sundsfjord, A., Steinbakk, M. et al. (2016).

*Thanner et al (2016) note that determining how resistant bacteria transfer themselves or genes to other organisms or environments is difficult to comprehensively delineate due to the many possibilities available – for instance, knowing whether a resistant bacteria was obtained from eating contaminated meat, a contaminated crop that had animal waste on it, or human-contaminated items not associated with the animal at all is difficult to discern.

⁴⁴ Holmes, A.H., Moore, S.P., Sundsfjord, A., Steinbakk, M. et al. (2016).

⁴⁵ Katrime Integrated Health. (2016).

⁴⁶ Tang, K.L., Caffrey, N.P., Nóbrega, D.B., Cork, S.C. et al. (2017).

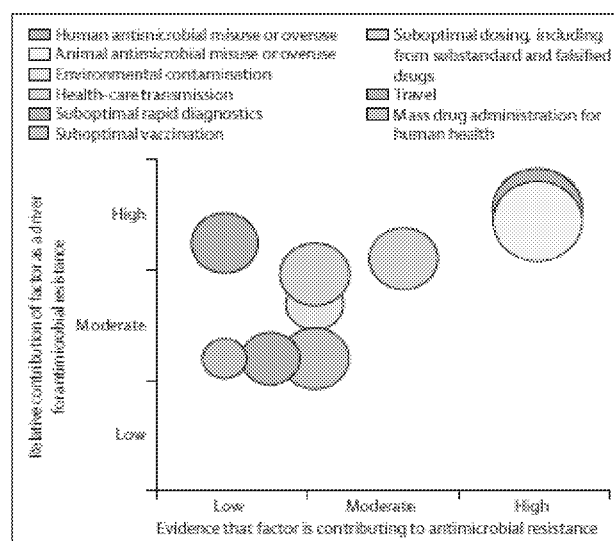


Figure 1. Expert consensus on the relative contributions of factors driving antimicrobial resistance. (Holmes et al., 2015).

Given this reality, what can be done?

Efforts to reduce AMR in human health are clear – such as reducing unnecessary and improper use through stewardship and regulation, improving drug quality and standards, and enhancing surveillance and monitoring. Similarly, in agriculture, albeit to perhaps a lesser extent, clarity exists on some steps for action such as the reduction of antimicrobial usage in food-producing animals, the use of alternatives, awareness improvement, and good animal husbandry.⁴⁷ However, while cost-savings can be gained from antibiotic reduction, potential consequences can exist such as increased need for therapeutic use, increased animal infections, and higher costs for producers.⁴⁸ Least clear – both in evidence and practice – is the way forward for environmental reduction of AMR, although this is intimately linked with human health and agriculture practices.

In global forums, the relative focus of different agendas had to variation in the prioritisation of commitments. For instance, while the G7 Ministerial Declaration on AMR gives significant attention to both human health and agriculture, the G20 Berlin Declaration is less focused on agriculture. Despite giving some attention to the importance of the responsible use of antibiotics in food-producing animals in a 2017 Ministerial Declaration, the G20 Berlin Declaration primarily focuses on human health implications thereby suggesting a neglect of the role of agriculture in that forum.^{49,50,51} Interestingly, both appear to note environmental

⁴⁷ Tang, K.L., Caffrey, N.P., Nóbrega, D.B., Cork, S.C. et al. (2017). Restricting the use of antibiotics in food-producing animals and its associations with antibiotic resistance in food-producing animals and human beings: a systematic review and meta-analysis. *Lancet Planet Health*. 1, e316-327. doi: 10.1016/S2542-5196(17)30141-9.

⁴⁸ Haihong, H., Cheng, G., Iqbal, Z., Xiaohui, A. et al. (2014). Benefits and risks of antimicrobial use in food-producing animals. *Frontiers in Microbiology*. doi: doi.org/10.3389/fmicb.2014.00288.

⁴⁹ G20. (2017). *Berlin declaration of the G20 Health Ministers*. G20. Available from: https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/3_Downloads/G/G20-Gesundheitsministertreffen/G20_Health_Ministers_Declaration_engl.pdf [Accessed 13 March 2018].

antimicrobial concerns but do not focus a large amount of attention on interventions. In recent years, the importance of the environment appears to be gaining further attention as demonstrated by the 2017 WHO-UN Environment collaboration on environmental health risks that followed from a COP 22 outcome (See Appendix 1).^{52,53,54} Clearly, the relative importance of the contributors to AMR is a challenge being grappled with at the international level, which has implications for political action. Human health has garnered the most attention, but still lacks strong political action; agriculture and animal antimicrobial use requires both more attention and political action; and AMR in the environment lags far behind in both respects and in its evidence-base.

⁵⁰ G7. (2015). *Declaration of the G7 Health Ministers*. G7. Available from: https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/3_Downloads/G/G7/G7_Health_Ministers_Declaration_AMR_and_EBOLA.pdf [Accessed 13 March 2018].

⁵¹ G20. (2017).

⁵² G20. (2017).

⁵³ G7. (2015).

⁵⁴ United Nations Environment Programme. (2018). *UN Environment and World Health Organization agree to major collaboration on environmental health risks*. Available from: <https://www.unenvironment.org/news-and-stories/press-release/un-environment-and-world-health-organization-agree-major> [Accessed 4 April 2018].

2. Addressing AMR: current ideas and barriers to implementing them

To date several attempts have been made to examine the various drivers to AMR and to propose solutions. These include several high-level reports, as well emerging regulation and practices, for example in the EU (see 3b).

(a) Major reports on AMR and what they tell us

There have been six major documents from key United Nations (UN) organizations; including the Food and Agricultural Organisation (FAO), the Interagency Coordination Group (IACG), the World Bank, the World Organisation for Animal Health (OIE), and the World Health Organization (WHO), as well as the O'Neill Review on Antimicrobial Resistance. Additionally, included in this analysis is the GAP endorsed by both Member States of the UN and the tripartite of WHO-FAO-OIE, which serves as the base reference for a large proportion of the documents which are summarised and analysed in Appendix 4.⁵⁵ From the existing major documents, including a G7 report on AMR in 2015, several common themes emerge, including:

- **Multi-sector global cooperation balanced with national action:** having multiple sectors strategize how to collaboratively and comprehensively govern AMR supported by comprehensive national action plans and global standards supported by best practice.
- **Awareness improvement:** raising awareness of AMR across sectors and deepening knowledge of infection prevention and control among public and private sectors.
- **Optimizing antimicrobial use:** promoting the responsible use of antibiotics through strict therapeutic use under appropriate supervision, regulation, and legislation while also ensuring the right quality and use dynamics of antimicrobials.
- **Surveillance and monitoring:** surveillance and monitoring of existing and emerging AMR patterns in health, agriculture, and the environment; mechanisms targeting them; and use of global standards.
- **Research and development:** supporting research and development on: AMR dynamics; best practices in agriculture, human health and the environment; and the development of antimicrobials, diagnostics, therapeutics, and vaccines.
- **Financing and incentives:** coordinating financing and investment, building an enabling environment for the private sector to engage and for agricultural producers to comply, and supporting resource-constrained countries requiring financial and technical support.^{56,57,58,59,60,61,62}

⁵⁵ World Health Organization. (2015). *Global action plan on antimicrobial resistance*. World Health Organization. Available from: <http://www.who.int/antimicrobial-resistance/global-action-plan/en/> [Accessed 4 April 2018].

⁵⁶ Bundesministerium für Gesundheit (BMHG). *Combating antimicrobial resistance*. BMHG. Available from: www.g8.utoronto.ca/healthmins/AMR_Best_Practices.pdf [Accessed 4 April 2018].

⁵⁷ O'Neill, J. (2015).

⁵⁸ Food and Agriculture Organization (FAO). (2016). *The FAO action plan on antimicrobial resistance 2016-2020*. FAO. Available from: www.fao.org/3/a-i5996e.pdf [Accessed 10 March 2018].

⁵⁹ Interagency Coordination Group on Antimicrobial Resistance (IACG). (2017). *AMR framework for action supported by the IACG*. IACG. Available from: www.who.int/antimicrobial-resistance/interagency-coordination-group/20170818_AMR_FfA_v01.pdf [Accessed 10 March 2018].

⁶⁰ World Bank. (2016).

(b) Barriers to applying existing solutions and best practices

While the solutions are generally aligned across these reports, there are several practical barriers which exist to implementation. These include:

Data gaps: To measure the magnitude and scope of AMR, countries need adequate surveillance and monitoring in humans and animals as well as of antibiotic sales and prescribing practices.⁶³ However, many countries have little or no access to comprehensive data, poor finances and infrastructure to procure such data, and disagreement on surveillance practices makes producing reliable AMR data even more difficult. To date, there have been insufficient efforts to collect evidence on the nature of AMR in many countries and to evaluate the impact of existing AMR control policies; this creates a major practical challenge to crafting and estimating the effect of new policies preventing their legitimization and implementation. Larger-scale evaluations and comparative effectiveness studies would help determine the most effective provisions to include in an international agreement.⁶⁴ Other problems exist, such as the variation in data openness. Some countries that have data may be reluctant to share it if they perceive it to be an impairment of their ability to conduct international trade – for example, if food exports were banned for having been antimicrobial-bred, this could be a disincentive to sharing data on how food is produced.⁶⁵

On the other hand, if this data is mandated, then the mandate could serve as an incentive to both make information available as well as to reduce antimicrobial use. Mandatory sharing of information is achieved in other areas of global governance. For example, in order to enhance global financial stability all members of the International Monetary Fund (IMF) accept regular surveillance. This involves teams of IMF economists visiting the country and preparing a report, which is usually published. More recently, this has been expanded to include an assessment of the resilience of the country's financial sector, the quality of its regulatory and supervisory framework, and the capacity to manage and resolve financial crises.⁶⁶ Clearly, the IMF is supported in this by:

1. a formal mandate in its Articles of Agreement,
2. an expert and well-resourced staff who can undertake the surveillance, and

⁶¹ World Organisation for Animal Health (OIE). (2016). *The OIE strategy on antimicrobial resistance and the prudent use of antimicrobials*. OIE. Available from: www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/EN_OIE-AMRstrategy.pdf [Accessed 22 March 2018].

⁶² World Health Organization (WHO), World Intellectual Property Organization (WIPO) & World Trade Organization (WTO). (2016). *Antimicrobial resistance – a global epidemic*. WHO, WIPO & WTO. Available from: https://www.wto.org/english/news_e/news16_e/heal_29aug16_e.pdf [Accessed 22 March 2018].

⁶³ World Health Organization (WHO). (2014). *Antimicrobial resistance - global report on surveillance*. WHO. Available from: http://apps.who.int/iris/bitstream/10665/112642/1/9789241564748_eng.pdf?ua= [Accessed 22 March 2018].

⁶⁴ Grace, D. (2015). *Review of evidence on antimicrobial resistance and animal agriculture in developing countries*. International Livestock Research Institute (ILRI). Available from: <https://cgspace.cgiar.org/handle/10568/67092> [Accessed 22 March 2018].

⁶⁵ World Health Organization (WHO). (2014). *Global surveillance of antibacterial resistance in humans 2nd WHO technical consultation*. WHO. Available from: <http://apps.who.int/medicinedocs/documents/s21640en/s21640en.pdf> [Accessed 22 March 2018].

⁶⁶ International Monetary Fund, Mandatory Financial Stability Assessments under the FSAP, International Monetary Fund, 2014 Sep 24 [cited 2018 Apr 1] available from: <http://www.imf.org/external/np/fsap/mandatoryfsap.htm>

3. a multilateral board which can discuss and choose to act (or not) on the information.

That said, reforms since 2009 motivated by questions over the legitimacy of the governance of the IMF and the suspicion that it is too US-dominated, led emerging economies in the G20 countries to insist on a more decentralized “Mutual Assessment Process to monitor each other’s macro policies within the G20.”⁶⁷

Lack of scientific agreement: Disagreement exists on many levels due to the complex nature of achieving scientific agreement on discrete and clear relationships between AMR and agricultural use. However, a lack of scientific agreement is not a reason for inaction. Analysis of successful global governance efforts (see Montreal Protocol, below) demonstrate the need to act on the ‘precautionary principle’, and that a highly flexible instrument can be developed in the initial framework so that regulation can be amended as the science becomes clearer. In respect of AMR, a technical body could advise on what practices are most important to combat, what alternatives are best, and what constitutes therapeutic or nontherapeutic antimicrobial use in livestock. Other areas lack clear evidence which make it difficult to assess what practices should be set, made, and legitimately adopted both within and across jurisdictions.⁶⁸ In other areas of global governance this has been addressed by the development of a technical and scientific advisory body, for example, the International Panel on Climate Change. The expert led panel is tasked with managing the assimilation of rapidly expanding scientific literature and providing policy-relevant, but not policy-prescriptive, advice to policy makers and the general public. There is not guarantee that the IPCC reports will translate to international or national law; for example, one missed opportunity was the 2009 UN summit in Copenhagen, which reached a non-binding agreement on actions to cut emissions (See Appendix 5, ‘Models of governance within and beyond health’).^{69, 70}

Economic impact and private interests: The potential economic impact – especially in countries where animals are kept in poor conditions – of an AMR agreement is a major concern for the agricultural industry, especially when recognising that banning AGPs is one of the most effective AMR prevention measures.⁷¹ However, there is a perception in the agricultural industry that AGPs help maintain consumer confidence and allow food producers to meet growing global demands. Industry lobby groups argue that banning

⁶⁷ International Monetary Fund, The G20 Mutual Assessment Process (MAP), International Monetary Fund, 2018 Mar 08 [cited 2018 Apr 11] available from: <https://www.imf.org/en/About/Factsheets/Sheets/2016/07/27/15/48/G20-Mutual-Assessment-Process-MAP>

⁶⁸ Landers T.F., Cohen B., Wittum T.E. & Larson E.L. (2012). A review of antibiotic use in food animals: perspective, policy, and potential. *Public Health Reports*. 127, 4-22. doi: 10.1177/003335491212700103.

⁶⁹ Intergovernmental Panel on Climate Change, History. IPCC Intergovernmental Panel on Climate Change. [cited Apr 17 2018] available from: http://www.ipcc.ch/organization/organization_history.shtml and United Nations Climate Change, About the Secretariat, UNFCCC, [cited Apr 17 2018] available from: <https://unfccc.int/about-us/about-the-secretariat>

⁷⁰ United Nations Climate Change, Information provided by Parties to the Convention relating to the Copenhagen Accord, UNFCCC, 18 Dec 2009 [cited 17 Apr 2018] available from: <https://unfccc.int/process/conferences/pastconferences/copenhagen-climate-change-conference-december-2009/statements-and-resources/information-provided-by-parties-to-the-convention-relating-to-the-copenhagen-accord>

⁷¹ World Health Organization (WHO). (2011). Mobilizing political will to contain antimicrobial resistance. *Bulletin of the World Health Organization*. 89(3), 168-69. doi: 10.2471/BLT.11.030311.

AGP creates financial losses and increases antibiotic consumption due to infections, illness, mortality, and animal suffering.⁷² Thus, countries with a strong agricultural presence may face domestic pressures against measures such as an AGP ban. A global “level playing field” would help here. But nevertheless, it is possible that the agricultural industry may not support an international AMR agreement without cost-effective alternatives to antimicrobials just as pharmaceutical innovators may not support an international AMR agreement without incentives to invest in R&D.⁷³ However, incentives cannot be achieved by increasing prices or sales volume, as such measures would undermine access and conservation and could be opposed by civil society.^{74,75} Other potential interests could hamper the adoption of best practice – for instance, in the veterinary profession, opposition may arise if veterinarians profit from the prescription and distribution of antimicrobials.⁷⁶ The most positive model of private industry change arose in the Montreal Protocol where DuPont’s development of an alternative to CFCs dramatically changed their incentive to support the Protocol.⁷⁷

Variations in capability: Not all countries have the same level of resource access, technical capacity, human resources, research capacity, and agenda-setting privileges. As a result, countries may not be able to set, formulate, legitimate, or adopt practices due to constraints that impair their capability to do so in one or more areas. Global sharing of knowledge and resources is likely to be vital for all countries to partake in the mitigation of AMR. Clear global goals and global arrangements must complement regional, national, and local action and ensure a common, but differentiated, responsibility which is contingent on a country’s capability to implement, monitor, and enforce agreements (see ‘Lessons from other areas for the global governance of AMR’, below). This effort will likely need to be supported by a financing facility that can support countries with incremental funding and technical support to meet goals. Importantly, positive work in this direction can be seen by the UK’s Fleming Fund on surveillance.⁷⁸

Existing arrangements and domestic pressures: Any new practices may face challenges in harmonising with existing arrangements in the pharmaceutical and agriculture industry; additionally, they may be challenged in being able to address national and regional

⁷² Casewell M., Friis C., Marco E., McMullin P. et al. (2003).

⁷³ Grace, D. (2015).

⁷⁴ Daulaire N., Bang A., Tomson G., Kalyango, J.N. et al. (2015). Universal access to effective antibiotics is essential for tackling antibiotic resistance. *The Journal of Law, Medicine & Ethics*. 43(2), 17-21. doi: 10.1111/jlme.12269.

⁷⁵ International Federation of Pharmaceutical Manufacturers & Associations (IFPMA). (2011). *Leading pharmaceutical companies present industry roadmap to combat antimicrobial resistance*. [Press release]. Available from: <https://www.ifpma.org/resource-centre/leading-pharmaceutical-companies-present-industry-roadmap-to-combat-antimicrobial-resistance/> [Accessed 22 March 2018].

⁷⁶ Williams-Jones B. & Béatrice D. (2010). Managing antimicrobial resistance in food production: conflicts of interest and politics in the development of public health policy. *Les ateliers de l'éthique*. 5(1), 157-69. Available from: www.ingentaconnect.com/content/doi/17189977/2010/00000005/00000001/art00013 [Accessed 22 March 2018].

⁷⁷ James Maxwell and Forrest Briscoe, “There’s money in the air: the CFC ban and DuPont’s regulatory strategy”, *Business Strategy and the Environment* (1998). <https://onlinelibrary.wiley.com/doi/abs/10.1002/%28SICI%291099-0836%28199711%296%3A5%3C276%3A%3AAID-BSE123%3E3.0.CO%3B2-A>

⁷⁸ Tackling antibiotics resistance in low income countries, Department of Health and Social Care, Gov.UK, 14 Nov 2016 [cited 10 Apr 2018] available from: <https://www.gov.uk/government/news/tackling-antibiotics-resistance-in-low-income-countries>

realities.⁷⁹ For instance, in India – a country with a large pharmaceutical presence – regulations on antimicrobial production and use will need to be worked through very carefully at national, regional, and local levels. Stakeholders and coalitions in support of AMR-containment will need mobilizing and a tailored approach will need to be adopted that considers local needs, capacities, and policies that do not threaten manufacturers.^{80,81} This clearly is not the case for all countries. For instance, in some cases, agriculture industry players themselves have taken action to reduce antimicrobial consumption – for instance, in the United States, providers such as McDonalds, Wal-Mart, and Costco have made efforts to raise antibiotic-free meat in response to consumer pressure.⁸²

In addition to these practical barriers, there are three major gaps in a global approach to AMR which the evidence points to, and these are:

- **Leadership and effective coordination across sectors** e.g. no one institution is tasked to take on responsibility although the tripartite is often mentioned; and while multisector efforts are noted as needed, no way of engaging stakeholders is commonly agreed upon or delineated. Leadership is needed to set the overall global goals and to mobilize across sectors to deliver those goals.
- **Governance** e.g. no specific regulatory framework is mentioned or endorsed, there is no clear institutional accountability for or capacity to set clear targets and undertake monitoring and surveillance across health, agriculture, and the environment or to make decisions based on that information;
- **Financing** e.g. no model for funding priorities and coordinated investment is consistently mentioned.

(c) Lessons from other areas for the global governance of AMR

Analysing the institutional response to other challenges at the global level provides lessons for how to best approach the global governance of AMR. Appendix 5, ‘Models of governance within and beyond health’ provides a detailed analysis, with the following discussion highlighting key insights for a one-health approach to AMR. Complementing Appendix 5 is Appendix 7, ‘Global governance platforms and key lessons, which provides a broader overview of a variety of global platforms along with their key objectives, governance arrangements, funding sources, and instructive lessons.

Intergovernmental

Framework Convention on Tobacco Control (FCTC)⁸³: This was the first international treaty adopted by the WHO and required state parties (180 states) to create, agree, and

⁷⁹ Abdula, N., Macharia J., Motsoaledi A., Swaminathan, S. et al. (2015). National action for global gains in antimicrobial resistance. *Lancet*. 387 (10014), e3-e5. doi: [10.1016/S0140-6736\(15\)00668-6](https://doi.org/10.1016/S0140-6736(15)00668-6).

⁸⁰ IMS Health. (2013). *Pharmerging markets: picking a pathway to success* [white paper]. IMS Health. Available from: www.pharmatalents.es/Publicaciones/detalle/7/post&33 [Accessed 22 March 2018].

⁸¹ Dar O.A., Hasan R., Schlundt J., Harbarth, S. et al. (2015). Exploring the evidence base for national and regional policy interventions to combat resistance. *Lancet* [Internet]. 387 (10015), 387:285. doi: [10.1016/S0140-6736\(15\)00520-6](https://doi.org/10.1016/S0140-6736(15)00520-6).

⁸² Kesmodel D., Bunge J., McKay B. (2014). *More companies go antibiotics-free as more consumers demand it*. The Wall Street Journal. Available from: <https://www.wsj.com/articles/meat-companies-go-antibiotics-free-as-more-consumers-demand-it-1415071802> [Accessed 13 March 2018].

⁸³ Roemer, R., Taylor, A., & Lariviere, J. (2005). Origins of the WHO Framework Convention on Tobacco Control. *American Journal of Public Health*, 95(6), 936–938. <http://doi.org/10.2105/AJPH.2003.025908> and

implement policies targeted at regulating the tobacco industry. It includes specific actions such as:

- implementing strong packaging and labelling requirements,
- adopting price and tax measures,
- as well as general obligations to establish essential infrastructure for tobacco control such as a national coordinating mechanism.

The tobacco industry was not seen as a cooperative stakeholder; given the clear conflict of interest it was not allowed to participate in any of the above processes. The FCTC is largely seen as an effective arrangement given that between 2005 and 2015, more than 130 parties that ratified the Convention had either strengthened their tobacco control legislation before having ratified the treaty or have adopted new treaty compliant legislation.

There are three lessons one might draw from the FCTC:

1. **Global arrangements complement regional, national, and local action:** in the case of tobacco control, even before the treaty was adopted and while the negotiations were in process, a number of governments took action to strengthen their legislation and programmes on tobacco control. On AMR, stakeholders in various countries are already taking action, such as the above-mentioned private companies in the USA, and EU legislators. A global agreement can draw on and complement these initiatives.
2. **Economic alternatives increase the chance of successful regulation:** the FCTC under Article 17, notes that parties are obligated – in cooperation with each other and with competent intergovernmental organizations – to promote economically viable alternatives for tobacco workers, growers and, as the case may be, individual sellers. In agriculture, the creation of alternatives to the above-mentioned use of antibiotics used as growth-promoters will be crucial.
3. **Litigation drawing on trade law is a barrier to regulation in health:** trade treaties have been increasingly invoked to challenge tobacco control policy, as was the case in the introduction of plain/standardised packaging in Australia. Indeed, further legal challenges and threats to alleged commitments to international economic agreements are being invoked to prevent, delay, or overturn tobacco control legislation.⁸⁴ The containment of AMR will require industry in several sectors to accept a new approach. Below we give further ideas about what would make this likely.

Montreal Protocol on Substances that Deplete the Ozone Layer: The Montreal Protocol aimed to ban the global production and use of ozone-damaging chemicals, including chlorofluorocarbons (CFCs).⁸⁵ It includes multi-stakeholders (such as Member States of the

Eriksen M, Mackay J, Ross H. The Tobacco Atlas, Atlanta, GA: The American Cancer Society. Available from: http://3pk43x313ggr4cy0lh3tctjh.wpengine.netdna-cdn.com/wp-content/uploads/2015/03/TA5_2015_WEB.pdf and The WHO Framework Convention on Tobacco Control: an overview, World Health Organization, January 2015, available from: http://www.who.int/fctc/WHO_FCTC_summary_January2015_EN.pdf?ua=1

⁸⁴ See also 2014 British America Tobacco lobbying to prevent plain-packaging regulations within United Kingdom, in Eriksen M, Mackay J, Ross H. The Tobacco Atlas, Atlanta, GA: The American Cancer Society. Available from: http://3pk43x313ggr4cy0lh3tctjh.wpengine.netdna-cdn.com/wp-content/uploads/2015/03/TA5_2015_WEB.pdf

⁸⁵ Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer, Ozone Secretariat, UNEP (2018), accessed on 8 March 2018, available from: <http://ozone.unep.org/en/handbook-montreal-protocol-substances-deplete-ozone-layer/25411> and Rae, I. Saving the ozone layer: why the Montreal Protocol worked.

UN, research scientists, chemical companies) and created a financing facility (Multilateral Fund for the Implementation of the Montreal Protocol) and a technical group to support signatories to reach decisions on complex matters (Technology and Economic Assessment Panel).

Trade provisions included in the Montreal Protocol mean signatories can only trade with other signatories. Therefore, once the main producing countries ratified the treaty, other countries had to follow given the increasingly limited supplies of other ozone-depleting substances (ODS). The main objective of the Multilateral Fund is to assist developing country parties to the Montreal Protocol whose annual per capita consumption and production of ozone depleting substances (ODS) is less than 0.3 kg to comply with the control measures of the Protocol. The Montreal Protocol is seen as reasonably effective given that all 142 developing countries were able to meet the 100% phase-out mark for CFCs in 2010 and the ozone layer is expected to return to 1980 levels between 2045 and 2060. In terms of compliance, the Protocol was designed from the outset as a non-punitive procedure where developing countries – who had become non-compliant – are supported by a UN agency to prepare an action plan to work towards compliance.⁸⁶ If necessary, resources from the Multilateral Fund are available for short-term projects.

The Montreal Protocol provides four lessons:

1. **Flexible regulation is possible even without scientific consensus, illustrating the importance of the ‘precautionary principle’:** a highly flexible instrument was developed to increase or decrease controls as the science became clearer, which occurred after the initial framework was negotiated. Indeed, early conclusions about the extent of ozone depletion turned out to be significantly under-estimated. Given the uncertainty over the effects on AMR of agricultural useage, a flexible science-based approach could be very valuable.
2. **Common, but differentiated, responsibility** is necessary in order to protect and manage the global commons, and developing countries were given longer to phase-out ODS. For AMR this is particularly important, since providing access to antibiotics is in some cases more urgent than addressing AMR.
3. **A limited source of producers makes regulation easier:** it was easier to focus on reducing the volume of CFCs given that production was restricted to a small number of firms, most in industrial countries. AMR faces a larger challenge.
4. **Again, economic alternatives increase the chance of successful regulation:** there were benefits for industry of moving away from ODS – CFCs were old technology, and expensive – transition to new, reasonably priced options with no- or lower-depleting potential benefited the industry and environment. New forms of animal husbandry might well provide the kind of alternative which assists in the regulation of AMR.

The Conversation, Melbourne. 9 Sep 2009, accessed on 8 Mar 2018, available from:

<https://theconversation.com/saving-the-ozone-layer-why-the-montreal-protocol-worked-9249>

⁸⁶ The four implementing agencies, which have contractual agreements with the Executive Committee, are; the United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), United Nations Industrial Development Organisation (UNIDO) and the World Bank, see Secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol, Implementing Agencies, available from <http://www.multilateralfund.org/aboutMLF/implementingagencies/default.aspx>

Extractive Industries Transparency Initiative (EITI): EITI is a **tripartite model** of governance between governments, companies, and civil society organizations, which combines voluntary participation, mandatory implementation, and independent validation of extractive sector revenue disclosure for companies and governments.⁸⁷ EITI standards require the implementing countries to disclose revenue flows disaggregated by company and government entity, and to be provided at subnational level when revenues from companies go to subnational government units. Financial and diplomatic support from donor countries has been encouraged by the EITI International Secretariat to meet the institutional goal of supporting “countries to implement the EITI”. Analysts have suggested that one of EITI’s most impressive achievements is the virtually universal acceptance, and the support the EITI has mobilised from the international community, private sector, and civil society.

However, it has had limited effectiveness for several reasons. First, increased information has not necessarily led to improved accountability – in particular, multiple studies have found that, although reports were completed, they were piggybacking on pre-existent reforms. Second, once compliance has been reached, “international reputation” is no longer at stake and the “chance of delisting is very low, since the EITI is eager to increase institutional success through increasing compliant country numbers”. Finally, there has been a lack of adoption by many of the most resource-rich countries, and institutional adoption is mostly driven by incentives or external pressures – such as foreign aid dependence or the need for diplomatic and security support. These are factors that would have little influence over some of the oil-rich countries “in need” of the EITI.⁸⁸

Reviewing the EITI provides three clear lessons:

1. **A consensus-based approach can be a slow and incremental mode of governance:** the actual implementation of the EITI between commitment and candidacy was 2.8 years, and 4.3 years between candidacy and compliance, often requiring a focus on the smallest common denominator. Further, the EITI International Secretariat has argued that it is “more important for the stakeholders to agree on smaller, actionable issues, than to aim for large overarching long-term goals that might seem unachievable.” The timescale for acting on AMR is likely too urgent to be well-served by a slow process.
2. **Many of the implementing countries lack both the human and financial capacity to implement regulations:** the EITI requirements necessitated the production of information within the stipulated timeframes and for countries to disseminate it effectively, in a comprehensible manner to the wider public. Similarly, the implementation of measures to reduce AMR will require investments in monitoring and data collection.

⁸⁷ Rustad SA, Le Billon P, Lujala P. Has the Extractive Industries Transparency Initiative been a success? Identifying and evaluating EITI goals. *Resources Policy*. 2017 Mar 1;51:151-62 and EITI, 2016. The EITI Standard 2016. EITI International Secretariat, Oslo. Accessed on: 8 Mar 2018, available from: <https://eiti.org/standard/overview>

⁸⁸ David-Barrett, E., Okamura, K., 2016. Norm diffusion and reputation: the rise of the extractive industries transparency initiative. *Governance* 29, 227–246. <http://dx.doi.org/10.1111/gove.12163>

3. **Transparency should not be the only goal:** in the case of the EITI, at the very least, “the effectiveness of improving transparency should be more systematically evaluated vis-à-vis other policy options”, as it does not necessarily improve resource-dependent economic growth. By contrast, the benefits of a global approach to AMR are much more of a collective good, to which end, all participating countries will need sight of compliance by others.
4. **Voluntary initiatives may detract from mandatory ones:** the EITI provided an argument to those opposed to mandatory regulation that a “constructive”, voluntary, and tripartite approach was best suited and already existing. As such, EITI may have delayed these processes, notably by focusing the attention of the policy community on this voluntary initiative and “softening” the position of civil society organizations.

Self-regulation

Code of Pharmaceutical Marketing Practices, International Federation of Pharmaceutical Manufacturers and Associates (IFPMA).⁸⁹ The Code is a binding requirement of IFPMA membership. Operationalised in 1995, it emphasises the “principle of self-audit, through individual firms”. Article 3 requires all member associations and companies to adhere, which means that the promotion of any medicinal product, anywhere in the world, by any company that is a member of an IFPMA member association, must be in accordance with the provision of the Code, including: a) provisions on clinical research and transparency; b) fees for services; c) support for continuing medical education; d) interactions with patient organizations, training; and e) additional information on how complaints should be handled. Respective national territories can apply their own codes, which must reflect the IFPMA code at a baseline minimum but may contain more stringent provisions. It is then up to individual companies to interpret and translate the Code more “concretely into patterns of ethical behaviour”. Continuous monitoring and external sanctioning occurs at the national association level, and the IFPMA publishes periodic status reports on complaints received under the Code. It circulates these complaints to national drug regulatory agencies and international organizations.

The effectiveness of the Code has been limited by: a) lack of administrative capacity in developing governments; b) lack of national associations with a capacity to implement the Code and, if necessary, impose prompt and effective sanctions, either alone or in concert with local agencies. In an ideal response, if the Code is found to have been breached, IFPMA will publish the name of the company concerned and its offences. Information may also be made public in cases where a company fails to respond within a specific time. The logic here is that reports of “malpractice have damaging effects on both the patients and the professional status of those responsible for prescribing drugs. Repercussions for the image of all pharmaceutical procedures, irrespective of their own marketing, would likely follow”.

Two major lessons emerge from examining the Code:

⁸⁹ Francer J, Izquierdo JZ, Music T, Narsai K, Nikidis C, Simmonds H, Woods P. Ethical pharmaceutical promotion and communications worldwide: codes and regulations. *Philosophy, Ethics, and Humanities in Medicine*. 2014 Dec;9(1):7 and Code of Practice, International Federation of Pharmaceutical Manufacturers & Associations, available from: <https://www.ifpma.org/subtopics/code-of-practice-2/> and Ronit K, Schneider V. Global governance through private organizations. *Governance*. 1999 Jul 1;12(3):243-66.

1. **The key purpose of self-regulation is often to avoid multilateral regulation:** seen from the industry's perspective at that time, an important aim was to avoid the more imminent threat of public regulation at the international level and to avoid, therefore, surrendering the issue unconditionally to the WHO. The public interest in containing AMR, however, will only be served if a similarly constructed self-regulation were powerfully effective.
2. **Voluntary network limits global coverage:** despite seeking global coverage, the IFPMA itself is not in a position to fully monitor the degree of compliance worldwide. Instead, it relies primarily on the information provided by member associations and individual companies – “membership is strongly biased towards industrialised countries...[T]his discrepancy between intended and actual coverage by self-regulatory mechanisms is a perennial problem, although there have been successful attempts to apply and strengthen self-regulation in regional and national contexts”. This limitation is clearly problematic for ensuring a global approach to AMR.

Collective Asset Clauses (CACs) in International Bonds and an International Code of Conduct for Sovereign Debt Restructuring: Leading sovereign debtors, private financial actors, and creditor governments – particularly US treasury officials* – initiated this voluntary Code of Conduct because of a set of crises – the international financial crises of 1994 and 1997-98 – demonstrated the costs associated with the existing bailout model of handling sovereign debt crises.⁹⁰ The IMF and World Bank were initially involved; however, discussions were restricted to a narrower dialogue between a small group of private financial interests – primarily the Institute of International Finance (IIF) and International Primary Market Association (which represented debt underwriters) – and emerging market governments – particularly Mexico, Brazil, Turkey, and Korea. The IFF and Northern banks, rather than acting as regulators, serve more as coordinators “in the building of a voluntarist public-private hybrid networked form of governance”. In December 2005, they began publicly evaluating the extent to which emerging market governments were complying with the Principles in areas such as investor relations and information sharing. In March 2006, the IIF also established a “Group of Trustees” to review the implementation, and possible further development of the Principles.

At the end of 2002, only 30% of sovereign bonds issues by emerging markets had CACs, and most had been issued in London. By 2004, close to 90% of new international bond issues had CACs, and the figure had approached close to 100% by 2005. The rapid spread of CAC bonds resulted from the combination of the unilateral decisions of debtor governments to issue them and the embrace of these bonds by private creditor interests designed to facilitate a more orderly restructuring of unsustainable sovereign bond debt owed to foreign private creditors, by allowing for such things as: a) debtor-initiated restructuring and payments suspension; b) the collective representation of creditors in a crisis; c) qualified majority

* The Role of US Treasury is worth noting, as they explicitly encouraged “developing countries to begin to issue CAC bonds by lobbying borrowers and investors...and encouraging the IMF to begin to promote the issue of CACs in annual country and multilateral surveillance efforts” and “engaged in some intense direct lobbying of developing-country governments”.

⁹⁰ Helleiner E, Filling a Hole in Global Financial Governance? The Politics of Regulating Sovereign Debt Restructuring in Mattli, W., & Woods, N. (Eds.). (2009). The politics of global regulation. Princeton University Press and In Whose Benefit? Explaining Regulatory Change in Global Politics, Mattli W and Woods N., in Mattli, W., & Woods, N. (Eds.). (2009). The politics of global regulation. Princeton University Press

voting by bondholders to alter terms and conditions of bond contractors; and d) restrictions on the ability of individual creditors to sue debtors or demand full repayment. CACs only applied to new bonds being issued, leaving many of the key decisions concerning debt restructuring in the hands of the private creditors, rather than allocating them to an independent arbiter, or sharing power more equally with sovereign debtors in a formal institutional setting.

Three lessons emerge from this approach:

1. **The threat of stronger regulation helped push through the voluntary code:** although private sector actors and debtor governments played important roles in establishing the new patterns of global regulation, their initiatives emerged very much within the “shadow” of dominant states and bodies, especially the United States and the IMF, who were noting that attention should be given to the idea of an international bankruptcy law for sovereign debtors – “we need an agreement on international bankruptcy law so that we can work with governments that, in effect, need to go through a Chapter 11 reorganization instead of socialising the costs of bad decisions”. Indeed, many analysts have noted that the US and G7 seemed to be deliberately keeping the Sovereign Debt Restricting Mechanism (SDRM) – a statutory mechanism that served as a regulatory alternative – proposal on the table until early 2003 as a way of “prompting private financial interests to accept CACs”.
2. **Never waste an international crisis:** analysis has shown that the move toward regulating sovereign debt restricting was driven by an international crisis that symbolised in a “visible and dramatic way how international financial policy making had been increasingly captured by the interests of private creditors”, as “moral hazard became ranked as a much higher concern and one which the old model could not adequately deal with”. The time to create a new regulatory regime is when the public spotlight is on an issue, giving legislators and other stakeholders a powerful incentive to act.
3. **There will be challengers to stronger statutory regulation that might accept a softer alternative:** private creditors emerged as strong critics to SDRM because: a) the SDRM could override contract provisions and restrict creditors freedom by imposing standstill and/or restrictions on the freedom to litigate; and b) the SDRM would bolster sovereign debtors bargaining position during restricting negotiations. Ultimately, the SDRM proposal was seen as overly bureaucratic solution that would give the IMF too much power. As a result, the preference was for the more decentralised, market-oriented solution offered by the CACs and Code of Conduct. Of course, the subsequent Eurozone crisis highlighted that the regulation undertaken was not sufficient.

(d) Lessons from other governance arrangements in global health

Three of the largest global health initiatives, the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund), the GAVI Alliance (Gavi) and the Joint UN Programme on HIV/AIDS (UNAIDS) also hold lessons for the global governance of AMR. Both the Global Fund and GAVI function as international public-private partnerships (PPPs) that funnel capital into middle and low-income countries for specific vertical health programmes and are based on the concept of performance-based funding. In contrast, UNAIDS was established to coordinate the UN response to HIV/AIDS as well as experiment with how a coordinated,

multisector response could look at both a global and national level. Donor dissatisfaction, particularly the bureaucracy of the UN, and lack of trust with existing institutions promoted the emergence and institutional shape of all three new initiatives.

Global Fund to Fight HIV/AIDS, TB and Malaria⁹¹: The Global Fund was created in 2001 to serve as a financing mechanism for HIV/AIDS, TB, and malaria. Its mandate is extremely narrow to attract and disburse additional resources to prevent and treat three diseases. Although it is officially a Swiss foundation, it receives administrative support from the WHO and fiduciary support from the World Bank as a trustee.⁹² The new initiative was created to not only significantly increase the resources available to countries to address these three diseases, but also to ensure that allocation was demand-driven, aligned to country ownership and performance-oriented.⁹³ Through the country coordinating mechanism (CCM) each country is responsible for determining its own needs and priorities (within the three diseases), based on consultation with a group of diverse stakeholders including national and local governments, NGOs, the private sector, and people living with, or affected by, the diseases.

The Global Fund experience reveals several lessons:

1. It is possible to create a new initiative even when an existing UN institution exists: The idea of the Global Fund was first discussed at the 2000 G8 meeting in Okinawa and again at the 2001 Abuja African Leaders Summit. In Abuja, Kofi Annan, then Secretary-General of the UN, called for the creation of a global fund to provide a new channel for additional resources to target HIV/AIDS, tuberculosis, and malaria. He called for a 'war chest' of US\$10 billion per year to fight HIV/AIDS and other infectious diseases. In June 2001, a UN General Assembly Special Session concluded with a commitment to create such a fund, which the G8 supported and helped finance at their 2001 meeting in Genoa. In January 2002, a permanent secretariat was established, and just three months later, the Global Fund approved its first round of grants.

2. A new initiative can mobilize a diverse set of stakeholders towards a common vision and purpose: The Global Fund is governed by a Board that includes representatives of governments, civil society, the private sector, and philanthropic organizations. The Board is responsible for its governance, selecting the Fund's Executive Director, the approval of new policies, and the approval of grants. As of 2018, the Board is itself made up of 28 members, 20 voting members including 7 representatives from developing countries, 8 from donor countries, 3 from civil society, 1 from private sector, and 1 from the Bill & Melinda Gates Foundation. In addition, there are 8 non-voting members which include key partners such as WHO, UNAIDS, the World Bank, a Swiss citizen (a requirement of Swiss law), and the Global Fund's Board chair and vice-chair.

3. A new initiative with a dedicated secretariat can become a lightning rod for the mobilization of resources. The Global Fund has had huge success in fundraising even during turbulent economic periods. Through the mechanism of replenishment, the Global Fund receives voluntary contributions from governments, individuals, businesses, and private

⁹¹ Clinton C, Sridhar D Governing Global Health: Who Runs the World and Why (OUP, 2017).

⁹² See http://www.theglobalfund.org/documents/6_pp_fiduciary_arrangements_4_en.pdf for discussion of fiduciary arrangements

⁹³ While country ownership is a cornerstone of the Global Fund, the in-built priorities of the Fund (HIV/AIDS, TB and Malaria) result in countries being limited in what they can apply and use funds for.

foundations. Principal-agent theory would posit that the agent (the Global Fund) has been rewarded by key donors (principals) for delivering on their agreed objectives. These donors also had direct involvement in the creation of the initiative, and close monitoring on how the initiative is meeting certain objectives, and have reformed the initiative when it has not delivered what they expected. However, the funding base of the Global Fund is rather conventional and the top five donors to the Fund accounted for almost 65% of fundraising in its first thirteen years, with the US accounting for 31%.

Gavi⁹⁴: Gavi's mission is to use its market-shaping power to help close the 'vaccine gap' to help ensure that children in developing countries receive a full complement of crucial immunizations. Gavi's mandate is narrowly defined as increasing access to immunization in poor countries and the 18% rate of return on vaccines investment (for every \$1 invested in vaccination, a country realizes \$1.18 in economic benefit) is often what Gavi points to as justifying its singular focus.

Gavi's experience points to several lessons:

1. **Private foundations can play a huge catalytic role in creating a new initiative even when an existing UN institution is operating in that area:** Created in 2000 through an initial grant of \$750 million by the Gates Foundation, Gavi has leveraged its financial heft to shift the market around vaccines to a higher-volume, lower-cost dynamic and also to incentivize future vaccine research and development. At inception, it comprised two separate entities with two distinct boards, one focused on organizing the work of Gavi and the other on serving as a fiduciary agent for the funds Gavi raised (the Gavi Fund). The two merged in 2008 bringing all Gavi-related functions under one roof.
2. **A new initiative can mobilize a diverse set of stakeholders towards a common vision and purpose and be tightly integrated into the UN system:** Gavi's funds are used to purchase vaccines solely through UNICEF, and Gavi reimburses WHO for its technical support and UNICEF for its on-the-ground distribution support. The Board establishes all policies, oversees operations, and monitors programme implementation. The Gavi Board consists of 4 permanent seats for representatives from the Gates Foundation, UNICEF, WHO, and the World Bank; unlike at the Global Fund, Gavi's multilateral partners have voting seats on the Board. In addition, there are 18 rotating Board members who represent various constituency groups: developing country governments (5), donor governments (5), research and technical institutes (1), industrialized country vaccine industry (1), developing country vaccine industry (1), and civil society organizations (1). The Board also includes unaffiliated Board members (9) with no professional connection to Gavi's work under the rationale that they bring independent and balanced scrutiny to the Board's deliberations.
3. **A new initiative can undertake innovative financing instruments that leverage funds and complement these with traditional sources of funding:** Gavi also relies on donor contributions through replenishment, long-term pledges, and pledges to support the development and manufacture of vaccines. The most significant source of funds for Gavi is the Gates Foundation followed by the UK, US, and Norway. Gavi

⁹⁴ Clinton C, Sridhar D Governing Global Health: Who Runs the World and Why (OUP, 2017).

also has two innovative financing mechanisms. The first is the International Financing Facility for Immunizations which effectively securitizes long-term pledges from bilateral donors, converting the pledges into usable cash resources by selling bonds in the capital markets; the second is the Advance Market Commitment, a mechanism through which donors committed to purchase new pneumococcal vaccines at a price that covers development costs and provides some profit for the drugs' manufacturers with the provision that they be distributed only in low and middle-income countries.

A final key lesson from both the Global Fund and Gavi is that when **organizations increase their transparency, they are attempting to increase their own legitimacy and to build trust among donors and the public that they can indeed deliver on their respective missions.**⁹⁵

UNAIDS⁹⁶: In 1994, the Joint UN Programme on HIV/AIDS was established in order to ensure a multisectoral response to HIV/AIDS by leveraging the resources of its co-sponsoring UN agencies, as well as to experiment what this type of UN reform for an issue area could achieve. Under an ECOSOC resolution 1994/24, the primary objective of establishing UNAIDS was to lead an expanded, multisectoral and broad-based response to the AIDS epidemic.⁹⁷ The focus of the organisation was to:

- achieve and promote global consensus on policy and programmatic approaches;
- strengthen UN capacity to monitor trends and lessons learned and to ensure that appropriate and effective policies and strategies are put into operation at country-level;
- strengthen the capacity of governments to draw up, coordinate and implement a comprehensive national strategies;
- promote broad-based political and social mobilization to prevent and control HIV/AIDS within countries; and,

⁹⁵ Transparency is one of the main ways in which the Global Fund and Gavi are held accountable for delivering on their objectives, both to their boards (internal) as well as to the public (external). It is also seen as essential in building trust among key constituencies. From the Global Fund's beginning, it has published on its website all approved proposals, signed grant agreements, and grant-performing reports. The Global Fund also makes publicly available all reports from its inspector general as well as all non-executive session documentation considered by the Board and the minutes of Board and Board committee meetings. Gavi introduced its first transparency policy in 2009, updating it in 2013. Its policy couples transparency and accountability making clear that its commitment to transparency around cash and vaccine support is important both for its relationship with recipient countries as well as its stewardship for broader aid accountability. Gavi publicly provides the materials the Board considers, at least in its formal meetings, as well as the minutes from its committee meetings. The Aid Transparency Index scored Gavi at 100% for its public sharing of financial information and organizational level data. Both Global Fund and Gavi publish all financial information not only by grant, but also by country, disease area and year of funding, providing significant transparency into what it disburses to its grantees. Both the Global Fund and GAVI also provide support to their implementing/developing country Board members to facilitate their ability to meet outside of Board meetings and to be able to afford to Board meetings whether in Geneva or elsewhere.

⁹⁶ Sridhar D, Coordinating the UN System: Lessons from UNAIDS, <https://www.ncbi.nlm.nih.gov/pubmed/23116992>

⁹⁷ UNECOSOC. 1994. Joint and Cosponsored United Nations Programme on Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS). Resolution 1994/24. New York. Available at: http://data.unaids.org/pub/ExternalDocument/1994/ecosoc_resolutions_establishing_unaids_en.pdf.

- advocate greater political commitment in responding to HIV/AIDS epidemics at global and country levels, including the mobilization and allocation of adequate resources for HIV/AIDS-related activities.⁹⁸

Since 1994, UNAIDS has grown in size with a biannual budget of \$484 million (2018/19) and roughly 900 staff both in Geneva and in country and regional offices around the world. The UNAIDS experience provides several lessons:

1. **The creation of a new UN coordinating entity is possible particularly when the challenge is multi-sectoral and beyond the remit of one UN agency, such as the WHO.** UNAIDS emerged from the World Health Organization's (WHO) Special Programme on HIV/AIDS (GPA). A 1992 external review of GPA led, eventually, to the official decision to replace the programme with a new body that would coordinate the work of the UN on AIDS as well as provide an experiment in whether UN reform could work. The external review concluded that 'no single agency is capable of responding to the totality of the problems posed by AIDS; and as never before, a cooperative effort, which is broadly based but guided by a shared sense of purpose, is essential.'⁹⁹ The review's call for a new initiative was contested by some of the other UN agencies that would become cosponsors of UNAIDS due to uncertainty of what the new initiative might mean for their own agency. Despite this opposition, in 1994 it was agreed that a joint and cosponsored initiative would be established. The initiative would not be an agency in itself but leverage the resources of its co-sponsoring UN agencies. In part through its own design as a programme linking together a diverse group of cosponsors, UNAIDS has successfully promoted the notion that HIV/AIDS is not just a health issue but also a social and political issue requiring a multi-sectoral response. This distinction does not exist for almost all other disease areas.
2. **If there is real urgency to act on a health priority, the creation of a new initiative can serve as a focal point for global efforts in terms of advocacy and fundraising at the global, regional and national level.** UNAIDS has been the main advocate for increased financial, political and institutional attention to HIV/AIDS particularly before the creation of the Global Fund. To enable an exceptional response to HIV/AIDS, UNAIDS has made a strong case regarding the exceptionality of HIV/AIDS as a disease, drawing attention to its rapid spread into pandemic levels, the associated stigma and discrimination, the underlying gender imbalance, its impact on social structures, and its clinical complexity. Although UNAIDS does not play a role in financing HIV/AIDS activities directly, the sizable new resources for HIV/AIDS, and global health more generally, may not have been made available without UNAIDS constant lobbying of donors and key decision-makers.

Within countries, UNAIDS has promoted an exceptional institutional response through the creation of autonomous National AIDS Councils that often sit above Ministries of Health. In those countries where governments have either been unconcerned about addressing HIV/AIDS, UNAIDS has lobbied key decision-makers behind-the-scenes to adopt 'the three ones' (one national plan, one coordinating body,

⁹⁸ World Health Assembly Executive Board, 93rd Session. 1993. Study of a Joint and Cosponsored Programme on HIV/AIDS. Report EB93/INF.DOC/5.

⁹⁹ GPA Management Committee. 1992. Report of the Ad Hoc Working Group of the GPA Management Committee. April 24. GPA/GMC (8)92.5. Geneva.

one monitoring and evaluation system). Influence and access to Ministers of Finance, Health, and even Heads of State has been facilitated by the seniority of the leadership of UNAIDS. The Executive Director of UNAIDS is directly accountable to the Secretary-General of the UN; the seniority of the Executive Director gives him/her authority to speak on behalf of the UN system as an Under-Secretary General.

3. **A new coordinating initiative can leverage the strengths of existing UN institutions and complement these with inclusion of civil society and concerned citizens.** The original six cosponsors of UNAIDS were UNICEF, UNDP, UNFPA, UNESCO and the World Bank. However, this was later expanded to eleven co-sponsors including the ILO, UNODC, WFP, UNHCR and UN Women. The Programme Coordinating Board which oversees UNAIDS includes representatives of 22 governments from all geographic regions, the UNAIDS cosponsors listed above, and five representatives of nongovernmental organizations, including associations of people living with HIV. Cosponsors participate on the Board without the right to vote. The five NGO seats (3 from developing, 2 from developed) are invited to participate without the right to take part in the formal decision-making process and without the right to vote.
4. **A new initiative can become the go-to source for information and policy guidance on that specific issue.** For many years after its creation, UNAIDS was the main source of information on HIV/AIDS for donors, developing country governments and academics. With WHO's assistance, UNAIDS compiles epidemiological data on the HIV epidemic at the global, regional and national levels. The UNAIDS report on HIV/AIDS draws on the best available data from countries to provide an overview and commentary on the epidemic and the international response.

A concern about all the initiatives above is mandate-creep: although a secretariat might be established as a small, focused coordinating initiative, institutions tend to grow and become bureaucracies which broaden their mandate resulting in replication and inefficiency within the entire system.

3. Enhancing the global governance of AMR

Many aspects of controlling AMR can occur at the national level. However, AMR moves across borders and poses a clear collective action problem. No country acting alone can avoid the negative externalities of misuse in both humans and agriculture. In short, a global approach is required with a common endeavour to provide global public goods.¹⁰⁰ Further, any attempt must include both proper institutional design and be met with robust societal demand – from both public and private sectors alike – for the successful governance of antimicrobials to emerge. Several promising first steps have been taken.

(a) UNGA AMR Political Declaration, GAP, and other commitments on AMR

There is high-level political support for action on AMR emanating from a number of global forums. During a high-level meeting convened by the President of the UN General Assembly (UNGA) at the 71st General Debate, UN Member States adopted a political declaration on

¹⁰⁰ Frenk & Moon NEJM Paper on Governance in Global Health.

AMR. This followed work done for the G7 in 2015, and has been paralleled by the development of the GAP and efforts by the tripartite – WHO-FAO-OIE – to work together.

Most recently, a series of pledges were made by the G20 in Berlin in 2017, where G20 member countries committed themselves to developing national action plans and to support other countries to do so (See Appendix 1 and 4). They committed to:

- strengthening national and regional surveillance and monitoring
- raising awareness and promoting stewardship across all stakeholders
- endorsing certain programmes in addition to committing to supporting the G20 Agricultural Ministers' Declaration and Action Plan, the WHO End TB Strategy, and the WHO Global Framework for Development and Stewardship.

At the centrepiece of the G20 agreement was the endorsement the GAP as a blueprint for action and for the tripartite leadership of the WHO-OIE-FAO and the IACG. However, as an example of the lack of 'leadership and effective coordination across sectors' identified in Section 3c, the tripartite arrangement has a major challenge in that AMR sits across their mandates; e.g. WHO has no mandate to regulate or set standards on agriculture and representatives to the World Health Assembly (Ministers of Health) are limited in what they can agree to in the domain of agriculture. Similarly, the Ministers of Agriculture have no mandate over human health. The tripartite also does not include the environment (UNEP), nor private sector or civil society. This is why the case for a global forum or an overarching umbrella is worth exploring to protect the global commons of antibiotics and other antimicrobials.

At present, the IACG is consolidating recommendations from a number of initiatives and is recognized at the global level as a key stakeholder. Having been created in 2016 by the UN SG responding to the General Assembly agreement to focus on tackling antimicrobial resistance at a global level, the IACG's role is specifically to: a) provide guidance on the approaches needed to promote sustainable action, b) recommend how to best improve global coordination, especially on the insights brought forth through the GAP, and c) to report back to the Assembly as it convenes for its 73rd session.¹⁰¹ However, the IACG is not meant to coordinate, implement, govern, or enforce action leaving room for global governance action to take place – be it through a newly created framework or otherwise.

(b) Key opportunities from enhancing global governance

Enhanced global governance would involve the more robust creation of global standards or rules. Equally, it would require mechanisms which give assurance to any one government or firm that all others are complying with the rules. It could involve a wider group of stakeholders, including Member States; non-state actors such as civil society groups and funders (private & philanthropic); human, veterinary, agricultural, and environmental professional bodies; and private companies such as major agricultural and pharmaceutical firms. Knowledge would need to be shared within a body that is trusted and impartial to the interests of individual governments or particular firms. A robust shared financing mechanism would need to underpin this.

¹⁰¹ World Health Organization (WHO). *Ad-hoc Interagency Coordination Group*. Available from: www.who.int/antimicrobial-resistance/interagency-coordination-group/en/ [Accessed 4 April 2018].

Foremost an appropriate **global forum** is required for agreeing rules **across the domains of health, agriculture, and the environment and for leading discussions with governments, private sector, and civil society**. At present, governance is fragmented and siloed. The global forum must be **trusted** by the various stakeholders involved in AMR, including key donors. This forum is vital for convening negotiations and consensus building, setting priorities within AMR, and rules for participating stakeholders. It would also evaluate progress, ensure accountability, and advocate for human health concerns in other regimes such as trade, agriculture and IP. Elements of these key functions are worth elaborating.

Key functions the forum must deliver

Setting global standards and targets in human health, agriculture, and the environment, and creating mechanisms to ensure that they are implemented is of particular urgency. Agriculture presents a particular opportunity. While developing targets for human use is complex, there is large potential for reducing consumption in the animal sector. For example, similar to the EU's shift, a complete phasing out of the use of antimicrobial growth promoters could help avert the projected 67% increase in use for farm animals by 2030.¹⁰² Reducing counterfeit and substandard medicines present another opportunity. WHO noted that in LMIC, 1 in 10 medical products is substandard or falsified. For some drugs it can be as high as 20- 90% (e.g. antimalarials). This is hugely problematic for AMR as substandard dosing and not treating infections properly trigger resistance and widespread infection and even death. Finally, reducing environmental contamination provides another opportunity where regulation could cover restrictions on antibiotic effluents from pharmaceutical manufacturing, agricultural operations, and hospital waste that end up in waterways and contribute to the build-up of resistance genes in the soil and water.

Accurate monitoring and surveillance of (i) antibiotic use in health and agriculture, and prevalence in effluent, (ii) resistance levels and infections locally, nationally, and internationally, (iii) antimicrobial production, sales, use across sectors and within sectors should all be a key part of a global approach. Where countries have made national commitments, there needs to be monitoring of progress. However, in most countries of the world, this type of data is not available given weaknesses in local laboratory capacity. Laboratory capacity is a key part of the International Health Regulations, adopted in 2005 as a legally binding instrument of international law, require each government to have access to laboratory services and report to WHO. However, self-reporting to the WHO by Member States indicates that most governments are struggling to meet this requirement. Only 42 countries enrolled to the WHO Global Antimicrobial Surveillance System (GLASS) with only 22 providing data in 2017.¹⁰³ Similarly, the OIE has set global standards for antimicrobial surveillance programmes; however, a recent survey indicated that only 27% had systems for monitoring antimicrobial use in animals, with implementation lowest in Africa (5%) and the Americas (4%).¹⁰⁴ Adoption of and contribution to a standardized global surveillance system is necessary to identify the ongoing burden and scale of the problem and

¹⁰² Van Boeckel, T.P., Brower, C., Gilbert, M., Grenfell, B.T. et al. Global trends in antimicrobial use in food animals. *Proceedings of the National Academy of Science of the United States of America*. 112 (18), 5649-5654. doi: [10.1073/pnas.1503141112](https://doi.org/10.1073/pnas.1503141112).

¹⁰³ WHO, (2018). *Global antimicrobial surveillance system (GLASS) report*. WHO. Available from: www.who.int/glass/resources/publications/early-implementation-report/en/ [Accessed 15 March 2018].

¹⁰⁴ Hoffman, S.J., Caleo, G.M., Daulaire, N. et al. (2015). Strategies for achieving global collective action on antimicrobial resistance. *Bulletin of the World Health Organization*. 93, 867-876. doi: <http://dx.doi.org/10.2471/BLT.15.153171>.

to help direct support where needed.¹⁰⁵ As noted above, a small step in this direction is the £265 million Fleming Fund, an initiative of the UK Government, to build laboratory capacity, surveillance networks, and response capacity in low- and middle-income countries from 2015 to 2020.¹⁰⁶

Ensuring the effective monitoring and surveillance of regulation will require overcoming the data gaps identified in ‘Barriers to applying existing solutions and best practices’. Voluntary approaches to data sharing already exist in global governance for health, as part of the Global Health Security Agenda. This approach aims to support countries to develop capacities through a voluntary mechanism at the request of the country, where an internal assessment followed by a WHO Joint External Evaluation (JEE) or OIE Performance of Veterinary Services (PVS) Pathway is completed. The systematic, multisector evaluation aims to: a) identify most urgent needs, b) prioritise efforts, and c) engage current and prospective donors and partners in targeting resources. The success of this approach is evidenced by:

- Since February 2016, 72 JEEs have been conducted in six regions (as of April 2018), with 31 JEEs scheduled for 2018 and 2019.
- By December 2017, 384 PVS Pathway missions were conducted.¹⁰⁷

A more robust approach to monitoring is the model of IMF surveillance, which is underpinned by a formal mandate, an expert and well-resourced staff to support and undertake surveillance, and a multilateral Board which can discuss and choose to act (or not) on the information.

The **accountability** of the global governance process is vital for catalyzing multi-stakeholder actions and for ensuring that consumers and citizens become drivers towards the solution. Transparency on progress would permit them to mobilize to ensure real change occurs. For example, consumer organizations in the US and the EU have been leading the effort to ensure the removal of unnecessary antibiotics in food systems, and the increased rise in resistance in humans will likely give rise to patient advocacy. For the private sector, the long-term impact of private global business regulation depends on the extent to which its standards for business conduct and the mechanisms for holding companies accountable are integrated and reinforced by state-based regulatory policies at both the national and international levels.¹⁰⁸

Strong advocacy to keep a continual spotlight on the true scale of AMR and the economic consequences for households, health systems, and national economies (which aids with recognition of the problem by Heads of State) is an obvious element to strengthen. Such advocacy through framing AMR as an economic, security, and moral issue needs to occur not only in governments through multisector plans with clear targets but also through intersectoral cooperation at the global level (through institutional commitments to cross-sectoral coordination).

¹⁰⁵ Interagency Coordination Group on Antimicrobial Resistance (IACG). (2017). *AMR framework for action supported by the IACG*. IACG. Available from: www.who.int/antimicrobial-resistance/interagency-coordination-group/20170818_AMR_FfA_v01.pdf [Accessed 10 March 2018].

¹⁰⁶ Department of Health and Social Care, Tackling antibiotics resistance in low income countries, Gov.UK, 26 Nov 2016 [Accessed on: 3 Apr 2018] Available from: <https://www.gov.uk/government/news/tackling-antibiotics-resistance-in-low-income-countries>

¹⁰⁷ JEE Alliance, Joint External Evaluation (JEE), available from: <https://www.jeealliance.org/global-health-security-and-ihr-implementation/joint-external-evaluation-jee/>

¹⁰⁸ Vogel, D, The Private Regulation of Global Corporate Conduct in Mattli, W., & Woods, N. (Eds.). (2009). The politics of global regulation. Princeton University Press

It also worth considering how norms to promote action on antimicrobial resistance – that is , anti-antimicrobial norms – might originate, spread, and affect states and non-states. That is, which are the influential agents that are originating, and likely to continue to originate, AAM norms? And, what are the international and domestic mechanisms by which AAM norms are likely to spread widely among states and have a significant effect on the identity-related considerations or rational calculations of states and non-states in the direction of limiting or reducing use of antimicrobials?¹⁰⁹ For example, from the new global climate governance approach – which marks a critical departure from previous international attempts to govern the climate using hierarchical mechanisms involving enforceable incentives, including regulated-market mechanisms, as exemplified by the Kyoto Protocol – political mobilisation and international socialisation are recognised as ‘critical’.¹¹⁰

Domestically, it may be useful to personalise the ‘collective action’ challenge – “problems whose causes can be assigned to deliberate (intentional) actions of identifiable individuals are amenable to advocacy network strategies (including political mobilisation) in ways that problems whose causes are irredeemably structural are not”.¹¹¹ For example, in climate change, “no new oil pipelines” and “phase out coal” have helped concentrate moral pressure on the largest culprits of climate change. Here, the concentration of moral pressures can also undermine the latter’s external relations – specifically, it can help to isolate them from private supporters and enabling institutions (e.g sources of finance and cultural legitimacy who may be more sensitive than fossil fuel companies themselves to the effects of such pressure on their own reputations, legitimacy, and /or profits). The case of Perdue highlights the possibility of this for agricultural and pharmaceutical companies in the case of AMR.

Financing alternatives and innovations presents another opportunity. Most proposals focus on the development of new vaccines, diagnostics, and therapies for both humans and animals through a pooled fund. This requires innovative mechanisms, similar to the Gavi vaccine alliance, to ensure that a market exists for when these are developed (‘pull’) as well as funding to ensure that new products can be rolled-out in low resource settings. The development of cheap and rapid diagnostic tests would help correct the overuse of antibiotics by doctors, pharmacists, and veterinarians by ensuring they can make an informed decision on treatment. One estimate notes that a global fund of at least \$5 billion annually is needed in this area and could be organized through a replenishment process, such as used by the Global Fund and the Gavi Alliance through World Bank Trust Funds (soliciting multi-year donor commitments on a regular schedule rather than every year).¹¹² A first step in this direction is understanding the current landscape of funding for AMR including what is being funded in AMR sensitive or specific activities, by whom, and how much.

Finally, **private sector or corporate actors must be involved** where possible in global governance of AMR, as they are often ignored when it comes to regulatory change. The expertise, resources, and interests of pharmaceutical, agricultural, food and retail companies (see above, Economic Impact and Private Interests) make them particularly important in negotiations over the details, implementation and enforcement of any regulatory measures,

¹⁰⁹ Green F (2018) Anti-fossil fuel norms. *Climatic Change*. <https://doi.org/10.1007/s10584-017-2134-6>

¹¹⁰ Falkner R (2016) The Paris agreement and the new logic of international climate politics. *Int Aff* 92(5): 1107–1125

¹¹¹ Keck ME, Sikkink K (1998) *Activists beyond borders: advocacy networks in international politics*. Cornell University Press, Ithaca, NY, p891

¹¹² Laxminarayan R, Sridhar D, Blaser M et al (2016) Achieving global targets for microbial resistance. *Science*, <http://science.sciencemag.org/content/early/2016/08/17/science.aaf9286>

and there are the beginnings of positive progress in both pharmaceutical and agricultural sectors. Below we detail some potential coalitions of private sector companies who could lead in this.

In sum, AMR poses a global collective action problem, which countries can only solve by acting together. A global forum would help them to do this effectively – as a basic principal-agent approach highlights. Where the “principals”, such as governments, foundations, and industry, delegate to an “agent” such as a global forum, they can then pool information and resources to solve a problem. Key to this is the ability of principals to reward, or punish, the agent for delivering on its objectives. Typically, this is through funding (or not funding) a programme of work. In addition, trust is built through transparency on operations to both the “principals” of the agent (internal transparency, i.e. a Board) and to the general public (external transparency). Currently there seems to be no trusted multi-stakeholder mechanism to support in the governance of AMR, to deploy funding and to deliver on the opportunities outlined above.

(c) Building on existing models of global cooperation

Existing models of global cooperation offer some practical ways to strengthen the governance of AMR (Appendix 5 offers a detailed summary of these models). These vary on **who is involved**: the private sector, a range of stakeholders (NGOs, experts, public and private organizations), and governments. They also vary on **how standards are implemented, monitored, and enforced**, ranging from voluntary commitments made by parties, to more robust legal-style commitments.

For example, the Code of Pharmaceutical Marketing Practices agreed by the pharmaceutical and associated industries is a voluntary set of standards which seeks to achieve compliance through social pressure within the group. Other examples of this approach include the Responsible Care Code of the chemical industry or the Code of Conduct for Sovereign Debt Restructuring by the finance industry.

A multi-stakeholder approach can also be adopted in voluntary standard-setting, such as the Extractive Industries Transparency Initiative. Here an agreement was reached between governments, private sector companies, and NGOs, which was implemented through robust compliance requirements for membership with tripartite monitoring. The Global Reporting Initiative and Kimberly Process offer two other examples of multi-stakeholder approaches.

A more robust result from a multi-stakeholder process was captured in the Montreal Protocol which involved all stakeholders in negotiations but relied in the end of an agreement among governments with clearly set targets and agreed commitments by governments to achieve them.

Finally, the Framework Convention on Tobacco is an example of an exclusively inter-governmental approach to both negotiation and regulation which excluded the private sector to avoid undue influence and lobbying.

Scenario 1: Industry codes of conduct on AMR

A first scenario illustrates how a voluntary code of conduct might work. Codes of conduct would be agreed by the industries involved (pharmaceutical companies, healthcare providers, agriculture producers, food and retail companies). These would be voluntary and self-

regulating. This approach would build on a willingness already demonstrated by some parts of industry.

For example, major pharmaceutical companies have already shown willingness to engage in a global multi-stakeholder dialogue. A small group of major companies published an “Industry Declaration” at the Davos World Economic Forum meeting in 2016. They pledged their support for reducing the discharge of antibiotics into the environment, reducing inappropriate antibiotic use in humans and animals, improving surveillance and infection control measures, and improving global leadership, mobilising resources, setting goals, and measuring progress towards them. It is worth considering various corporate interests in taking a stronger stance against AMR.

Firstly, corporations who face reputational or consumer risks could be leaders in an AMR strategy. For example, major chicken producers in the US, such as Perdue Farms, have phased out the use of antibiotics in their production. This willingness has been driven by consumer groups drawing attention to the public health risk.¹¹³ Such action also promotes economic viability and has been referred to as a sensible business decision.¹¹⁴ Here, we are introduced to the idea of a ‘corporation at risk’: global firms that market to consumers. If such firms become associated with a disaster, scandal, or failure – think drug-resistance on the scale of Chernobyl or Bhopal – anti-corporate groups are likely to target them, taking advantage of the firm’s vulnerability to threats to public reputation and the value of their brand.¹¹⁵ As a result, it is possible that other highly visible companies will form alliances, producing civil regulation – in the form of voluntary codes – which may be judged to be relatively effective.

Another group of potential corporate supporters for an AMR strategy are companies who themselves are consumers such as McDonald’s, Subway, and Chick-Fil-A who may take a stance for the same reasons as individual consumers: health concerns. However, corporate consumers tend to be concentrated and highly influential – unlike mass consumers. Here, global firms that operate in multiple jurisdictions may similarly turn into ‘corporate levellers of the playing field’. For example, the fast food chain KFC initially remained opposed to amending their antibiotics policy. However, the broader adoption of higher health and environmental standards – no antibiotics for growth – by other companies, in response to activist pressure, impacted KFC’s business model. As a result, the company now has an incentive to work toward industry wide regulation to get their competitors to adopt similar standards to create a more level playing field.¹¹⁶

The above demonstrates what can happen when industry leaders – such as Perdue or McDonalds – agree to voluntary codes, other firms in the sector often decide to as well; the greater the number of global industries that agree to develop or accept voluntary codes, the more likely it is that other jurisdictions and industries will follow their example. The

¹¹³ Trotter, Greg, How one chicken company is kicking the antibiotic habit, Chicago Tribune, 2017 Oct 17 [Accessed on: 29 Mar 2018] available from: <http://www.chicagotribune.com/business/ct-perdue-antibiotics-chicken-1018-biz-20161017-story.html>

¹¹⁴ Scarr, Emily, If Perdue can do it, why can’t everyone?, The Baltimore Sun, 2016 Oct 22 [Accessed on: 2018 Mar 29] available from: <http://www.baltimoresun.com/news/opinion/oped/bs-ed-perdue-antibiotics-20161023-story.html>

¹¹⁵ Vogel, The Private Regulation of Global Corporate Conduct

¹¹⁶ Wattles, Jackie. KFC promises to ditch anti-biotic laden chicken, CNN Monday 2017 Apr 10 [Accessed on 2018 Mar 29] available from: <http://money.cnn.com/2017/04/08/news/companies/kfc-antibiotics/index.html>

international impact, and thus the potential leverage of many large corporations is substantial – changing the procurement policies of firms such as Starbucks and McDonalds – would have major global impacts, comparable to if not greater than that of some national regulations. As systems of civic regulation becomes further institutionalised, we can expect corporate motivation to participate to shift from a ‘logic of consequence’ to a ‘logic of appropriateness’.

At least one global forum for industry self-regulation already exists - the World Economic Forum. In addition, civil society – such as the Access to Medicine Foundation, an independent non-profit organization – are mobilising to provide independent analysis of pharmaceutical companies acting on AMR, covering antimicrobial research and development, responsible manufacturing, and appropriate access, and stewardship. Further developments could involve companies employing trusted third-party auditors to perform monitoring and surveillance which could then be reported in their Annual Reports. However, when standards are not legalised, we would expect accountability to operate chiefly through reputation and peer pressure rather than in more formal ways. As a result, although typically enforcement is weak in voluntary codes, members could always use a threat of expulsion against a fellow member.

There could also be some degree of accountability to shareholders and investors who have the power to hold companies to account on their pronounced intentions, as has been seen with the recent recognition of fiduciary duties company directors have with regards to climate-related risks. That is, companies need to treat the physical impacts of climate change on business and the transition risk to a low-carbon economy as a core business concern to be managed at the highest levels.¹¹⁷ It is possible that even if the same evidence of risk does not emerge, shareholders will begin to ask questions of directors. Indeed, investors are already doing so. In a January 2018 BlackRock letter to CEOs, Larry Fink noted that ‘society is demanding that companies, both public and private, serve a social purpose’. If the moral obligation to adopt the anti-antibiotic norm strengthens, then company directors may also be fiscally obligated to support regulatory movements.¹¹⁸

For self-regulation to be effective, it typically needs to exist in the shadow of robust regulatory conditions, such as reporting requirements which are not only enforced, but in which the quality and veracity of reporting is constantly being checked.¹¹⁹ Although in theory monitoring and surveillance could be undertaken by auditors, this model has failed in other cases. Dara O’Rourke’s extraordinary study of the work of auditors in surveillance of the voluntary code of conduct adopted by US apparel manufacturers is a cautionary tale. The auditors failed to uncover the most obvious breaches.¹²⁰

¹¹⁷ The Centre for Policy Development and The Future Business Council, Climate Change and Directors Duties, 2016 Oct 7 [Accessed on 2018 Mar 29], available from: <http://www.futurebusinesscouncil.com/wp-content/uploads/2016/10/Fiduciary-Duties-and-Climate-Change-Legal-Opinion-7.10.16.pdf>

¹¹⁸ Watchell, Lipton, Rosen & Katz, BlackRock Supports Stakeholder Governance, 2018 Jan 16 [Accessed on 2018 Mar 29] available from: https://s3-eu-west-1.amazonaws.com/ublend-parse-storage/95d21f24d3fc84f8e8606a4a4d29addcblackrock_supports_stakeholder_governance.pdf

¹¹⁹ Roberto Repetto, Making Disclosure Work Better: The Experience of Investor-Driven Environmental Disclosure in Making Global Self-Regulation Effective in Developing Countries, edited by Dana L. Brown, and Ngaire Woods, Oxford University Press, UK, 2007. ProQuest Ebook Central, <https://ebookcentral.proquest.com/lib/oxford/detail.action?docID=415507>.

¹²⁰ O’Rourke, Dara, (1997) Smoke from a Hired Gun: A Critique of Nike’s Labor and Environmental Auditing in Vietnam as Performed by Ernst & Young, report published by the Transnational Resource and Action Center: San Francisco, November 10th, available on the Internet at: www.corpwatch.org/trac/nike/ernst/

Another challenge with self-regulation is that it can easily fail to overcome the collective action problem spelt out above. If companies are not confident that their competitors are taking action, or know that their own inaction will pass unnoticed, it is unlikely that they will comply. “Regulatory forbearance” will occur, whereby parties sign up to voluntary regulatory measures because they know their inaction in respect of commitments will not be monitored or enforced. For example, the chemicals industry introduced a code of self-regulation after the Bhopal accident in India. However, in its first years of operation, the Responsible Care Code was shown by academics using Securities and Exchange Commission (SEC) filings to have attracted the worst performing companies, who failed to improve more than companies which stayed outside the code in its early years of operation.¹²¹ Self-regulation looked like a “green-wash”. However, other examples show more positive possibilities.¹²²

Finally, an industry self-regulation approach to AMR only touches upon one of the sectors involved. Patients, consumers, and public sector bodies must also be involved in efforts to contain AMR. The prevalence and use of antibiotics in agriculture across so many countries highlight that beyond large industrial players, governments and consumers must actively create a new environment. Yet, the credibility to include and to mobilize all stakeholders would likely require the promise of more than a simple expansion of existing voluntary undertakings.

For an industry code of conduct on AMR to be successful, the following are required:

1. Industry leaders – including pharmaceutical, agriculture, food and retail – to make public commitments to achieve measurable outcomes,
2. Independently verified monitoring of information regarding progress is collected, assessed and published,
3. Company executives report back on progress to shareholders, and
4. Involvement of all stakeholders in process, including members not directly participating in industry

Scenario 2: A multi-stakeholder-negotiated AMR protocol

The second scenario for the global governance of AMR would be a multi-stakeholder protocol (in the style of the Montreal Protocol), which would bring together Member States of the United Nations, research scientists (human health, agriculture, and environment), and major agricultural and pharmaceutical companies. These stakeholders must be convened by an AMR secretariat, which would ideally be situated in an existing institution with the capacity to monitor and report progress across health, agriculture and the environment, to which all countries report.

The protocol might lay out specific science-based targets for:

- Measurable reductions in the release of antibiotics into the environment;
- Reductions in uncontrolled antibiotic purchases and greater regulation, monitoring, and surveillance of the use and availability of antibiotics for human health;

¹²¹ Andrew King and Michael Lenox, Industry Self-Regulation Without Sanctions: The Chemical Industry's Responsible Care Program

Academy of Management Journal, Vol. 43, No. 4, pp. 698-716

¹²² See Michael Lenox and Jennifer Nash, “Industry self-regulation and adverse selection” , *Business Strategy and the Environment* 12 (2003) at

<http://www.yieldopedia.com/paneladmin/reports/22d95b19ba0ef5b5517a55ed1afc657b.pdf>

- Reducing the incidence of infection through effective sanitation, hygiene, and infection prevention measures;
- Cessation of the use of antibiotics for growth promotion purposes in farming including aquaculture, and agriculture; reductions in the use of antibiotics for animal health (at the very least on the precautionary principle) with flexibility built-in as more evidence comes to light;
- Implementation flexibility and financial and technical support for developing countries;
- Developing the economic case for sustainable investment that takes account of the needs of all countries and increases investment – for human and animal health – in new medicine, diagnostic tools, vaccines other interventions;
- Commonly funded and shared research and knowledge sharing into alternative forms of animal husbandry, high-yield agriculture, and antibiotic-free aquaculture.

A multi-stakeholder protocol could be brought together in a number of different ways. The United Nations is one forum, with parties brought together by the Secretary-General of the United Nations. For other intergovernmental processes (such as tobacco and climate), a key problem has been how to help stakeholders in countries with little capacity adopt new standards. In the Montreal Protocol this was dealt with by creating an Implementation Fund to overcome this problem by providing assistance (funding and institutional support) to stakeholders in developing countries in meeting the targets, as well as sharing knowledge and experiences among them. If the UN is recommended as the appropriate forum for AMR, such work could be undertaken by the UN and other implementing agencies (e.g. WHO, OIE, FAO, WTO, World Bank).

Other forums to consider include the World Economic Forum (which now has formal status as an International Organization), or a new Swiss Foundation with the World Bank as the fiduciary agent, similar to the Global Fund to fight AIDS, TB and Malaria. The main challenge is that if AMR does indeed require a protocol that is binding on states, then the forum chosen must have legitimacy to regulate across its member states.

The accurate monitoring and surveillance of an AMR Protocol should be undertaken by an AMR secretariat. This might be designated to a consortium of the implementing agencies (e.g. WHO, FAO, OIE, World Bank,), a coordinating mechanism hosted in the UN, or a designated international organisation reporting to the parties on an annual basis. This has been achieved in other domains. For example, in the US bilateral trade agreement with Cambodia (CAFTA), the International Labour Organization was invited by the parties to monitor labour standards.¹²³ In addition, countries could report their own progress within the SDGs framework on progress towards the specified targets (See Section 5, Monitoring the progress of implementation of AMR global governance), while firms report their progress through their annual reports and joint industry declarations, as per Scenario one. Missing at present is an international mandate to report on antibiotic usage in agriculture and prevalence in effluent and environmental contamination.

It is also worth noting that one lesson from other areas of global regulation is that the **threat of yet tougher regulation** (either at the national level or at the international level) **as well as**

¹²³

https://ustr.gov/archive/assets/Trade_Agreements/Regional/CAFTA/Briefing_Book/asset_upload_file80_7841.pdf

continual consumer pressure, such as in Europe and in the US, can be a tremendous spur to cooperation among stakeholders. The Montreal Protocol was expedited by the threat to US companies of tougher national level regulation which (in the absence of a global protocol) would have left them disadvantaged vis-à-vis competitors in other countries. A tougher international regulatory regime, pushed the private financial services sector to support and to expedite Collective Action Clauses to facilitate sovereign debt restructuring. Here, we see the different elements of scenario 1 and scenario 3 (see below) may work together to create an authorising environment which helps a viable path forward for the global governance of AMR. In addition, a key lesson is that alternatives need to be available to companies using antibiotics – thus, our recommendation earlier that a key function is investment in alternative practices in agriculture as well as development and roll-out of new vaccines and diagnostics.

Scenario 3: An intergovernmental AMR agreement

An agreement strictly among governments was the approach taken in the Framework Convention on Tobacco Control (FCTC). By 2015 it had been adopted by more than 130 countries, signalling their intent or adoption of new treaty compliant legislation. The tobacco industry was explicitly excluded from negotiations, due to the history of their undue influence. This model is worth considering, in part because such initiatives can catalyse a greater willingness on the part of non-governmental parties to come to the table and participate in a multi-stakeholder approach. Equally, the lessons on the necessary components of effective regulation can be derived from the EU (See Appendix 2) and highlight the importance of a centrally coordinated body that promotes international collaboration across sectors and includes clear goals that are legally enforced.

The key takeaway is that these elements could be secured within a protocol (as above), but alternatively, through **legislative enforcement**. This requires companies to comply with legislation and enforcing action with national-authority run inspections (both routine and for cause) on their activities both within and outside the EU market.^{124,125}

The experience of global regulation is that, in the absence of a powerful commercial incentive to accept regulation (such as DuPont's discussed above), the inclusion of industry in formulating regulatory standards is likely to lead to a steady dilution through each phase of the regulatory process. Specifically, once regulation passes from general agreement (when there is a public spotlight on agreements reached) to the less-newsworthy detailed regulation stage, and then to implementation, and finally to enforcement, the risks of dilution become stronger and stronger.¹²⁶

Applied to AMR, the exclusively inter-governmental model would have government signatories commit to establish essential infrastructure for AMR reduction, including

¹²⁴ European Medicines Agency (EMA). (2018). *Compliance*. EMA. Available from: http://www.ema.europa.eu/ema/index.jsp?curl=pages/regulation/general/general_content_001798.jsp&mid=WC0b01ac0580b2d7ba [Accessed 22 March 2018].

¹²⁵ European Medicines Agency (EMA). (2018). *Recommendations on the use of antibiotics in animals*. EMA. Available from: http://www.ema.europa.eu/ema/index.jsp?curl=pages/regulation/general/general_content_000639.jsp&mid=WC0b01ac058080a585 [Accessed 22 March 2018].

¹²⁶ In Whose Benefit? Explaining Regulatory Change in Global Politics, Mattli W and Woods N., in Mattli, W., & Woods, N. (Eds.). (2009). *The politics of global regulation*. Princeton University Press

adopting a national coordinating mechanism, national strategies and targets, enacting legislation, and protecting the regulatory system from private sector lobbying (e.g. of the agricultural and pharmaceutical industries). The burden of compliance would fall to each AMR signatory. Governments must enforce nationally

The elements of an AMR treaty would echo those of an AMR protocol (above) but would be translated into strictly governmental duties, such as:

- adoption of legislation controlling the release of antibiotics into the environment at all points in the supply chain;
- effective regulation and monitoring of antibiotic purchases and usage;
- adoption of legislation mandating effective sanitation, hygiene, and infection prevention measures
- legislation outlawing the use of antibiotics for growth promotion purposes in farming including aquaculture, and agriculture;
- requirements for labelling all food products;
- national strategy for reducing the use of antibiotics for animal health (at the very least on the precautionary principle) with flexibility built-in as more evidence comes to light;
- implementation flexibility and support for developing countries;
- commonly funded and shared research and knowledge into alternative forms of animal husbandry, antimicrobial alternatives, high-yield agriculture, and antibiotic-free aquaculture;
- a statutory body or national department responsible for contributing resources to assess the development – human and animal health – of new medicine, diagnostic tools, vaccines and other interventions.

The global forum would be the Conference of the Parties (COP), not unlike the AMR Protocol scenario, and could be supported by a secretariat which would collate global progress reports and maintain a global database. Equally, it could be supported by an implementation fund as above. Monitoring and surveillance would be done by national governments who would (under their treaty obligations) share information, promote information exchange, and report to the secretariat at least annually/biannually.

One obstacle to an effective new treaty is the threat of litigation by companies using pre-existing trade or investment treaties. For example, on tobacco, such treaties are increasingly being involved to challenge tobacco control policy, as was the case in the introduction of plain/standardised packaging in Australia and the UK. Indeed, further legal challenges and threats to alleged commitments to international economic agreements are being invoked to prevent, delay, or overturn tobacco control legislation (see 2014 BAT lobbying, footnote 156). For this reason, government parties to an AMR convention might commit to sharing information and resources to fight off any private sector actions.

In addition, there are several trade limitations that have a history of limiting the effectiveness of international treaties:

- The cumulative impact of trade policy as either a ‘carrot’ or stick’ remains limited as few western governments have been willing to link trade liberalisation to improvements in the regulatory practices of their trading partners, although several recent bilateral agreements entered by the US do incorporate linkages to labour and

environmental standards (see CAFTA) but their provisions have been poorly enforced.

- Many developing countries regard efforts to link access to western markets to their domestic business practices as a disguised form of protectionism.
- There has been a lack of consensus about how sanctions against non-compliant companies would be enforced.

On the positive side, the power of international legal regulation is that it can cascade into strengthened national level regulation. For example, in international criminal liability of leaders, the existence of an international treaty and courts led governments rapidly to adopt their own legislation and processes to avoid being paraded through an international procedure.¹²⁷ Likewise, the experience of the tobacco convention is that it led to a strengthening of national level regulation.

Table 1 – Three scenarios for stronger global governance of AMR

Mechanism	Global forum	Monitoring and surveillance	Adjudication and enforcement	Accountability	Pros and Cons
Codes of Conduct on AMR (among major firms in agriculture, pharmaceuticals, healthcare, animal care).	World Economic Forum	Use of third party auditors (see caveat); corporate annual reports; possible annual industry-wide report.	(at most potential expulsion from voluntary grouping of signatories)	To shareholders and investors (through Annual Report)	Pro: builds on existing willingness of companies/countries to influence other jurisdictions and industries. Cons: Risk of ‘regulatory forbearance’ - inaction despite commitments – and the robust regulatory conditions to make self-regulation successfully are currently lacking.
A multi-stakeholder-negotiated AMR Protocol	Under auspices of UN Secretary-General	A collaboration among agencies (e.g. WHO, FAO, OIE, World Bank) could report to the parties on an annual basis, and equally countries could report within the SDGs framework on progress towards the specified targets.	Naming and shaming; the involvement of non-governmental groups in monitoring. Trade provisions (only trade with signatories)	Reporting to the parties, and to a wider group of stakeholders e.g. parliaments, citizens and consumer groups etc.	Pros: The threat of regulation can increase stakeholder action. Cons: Lack of capacity in some countries to adopt new standards, and a successful protocol would have to engage many diverse stakeholders, making regulation challenging.
Strictly inter-governmental treaty	COP-style with own secretariat	By national authorities reporting to secretariat.	States must be willing to comply. No real enforcement ability.	Annual reporting by governments to each other.	Pro: International legal process can marry global and local efforts, allowing for flexibility as science evolves. Cons: There is currently a) no available alternative for treatment and prevention of disease b) in some countries, alternative animal husbandry practise are less viable than use of antibiotics for growth promotion purposes, meaning deciding how sanctions against non-compliant companies would be enforced is challenging.

¹²⁷Sikkink, K. From State Responsibility to Individual Criminal Accountability: A New Regulatory Model for Core Human Rights Violations in Mattli, W., & Woods, N. (Eds.). (2009). The politics of global regulation. Princeton University Press

All three scenarios will produce stronger results if they involve transparency and reporting to a wider range of stakeholders. As mentioned above, the role of consumers, citizens and their organizations is crucial. Equally worth considering is a requirement that all state parties report to their own parliaments or legislatures on an annual basis.¹²⁸

¹²⁸ See Eggers, Florini, and Woods, “Democratizing the IMF: Involving Parliamentarians” (2005)
https://www.geg.ox.ac.uk/sites/geg/files/GEG%20WP%202005_20%20Democratising%20the%20IMF%20-%20involving%20parliamentarians%20-%20Eggers%2C%20Florini%20%26%20Woods.pdf

4. Monitoring the progress of implementation of AMR global governance

Regardless of the governance model selected and developed in the future, it will be important to develop and agree the necessary accountability mechanisms which monitor the implementation of global governance for AMR and this will inform the future work of the Inter-Agency Co-ordination Group (IACG) on AMR who will report on progress and develop recommendations to the UN Secretary General in early summer 2019. Mechanisms must be adopted that: a) hold individual members accountable to their individual commitments and b) ensure that the practical guidance provided the UN Secretary-General ahead of the 73rd session of the UN General Assembly will receive broad support from Member States and other stakeholders so that c) effective global action to address antimicrobial resistance following September 2019 is ensured.

As the IACG have been tasked with developing the recommendations to the UN Secretary General on future global governance in the short and long term, members of the IACG must develop and agree to accountability mechanisms that will inform the work both before and after September 2019. A clear recommendation coming from the Leeds Castle meeting will support this process.

Pre-September 2019:

Following the Leeds Castle meeting, outputs from the meeting should lead to recommendations and plans for the further development, socialisation and implementation of a model of global governance of AMR. This will be achieved through wider IACG discussions and a report back to the UN Secretary General who will in turn report to the UNGA and Member States. These recommendations must consider: a) what metrics are used to monitor progress on future work, b) who is responsible for monitoring, c) what forum is it reported in, and d) b) where will the funding come from,

What are the metrics?

Progress on implementation should be monitored against the three major gaps identified in section 3, as failure to make headway on any one gap will greatly reduce the likelihood of effective global action to address AMR. Therefore, the success of implementation can be monitored against the degree to which:

- The “buy-in” of one-health stakeholders (e.g. the seniority of officials involved in negotiations) to a governance mechanism which engages, consults, and distributes responsibilities;
- The development and endorsement of clear, actionable targets, and a mechanism for monitoring national progress;
- The creation of a mechanism for funding identified priorities and coordinating future investment.

These core components will be in addition to any urgent, short-term recommendations that are identified by the IACG as part of a roadmap for the future of AMR governance. In addition, the operations of any secretariat or board (see below) must build trust among key constituencies. Transparency provides an obvious first step, as illustrated by the Global Fund and Gavi examples.

Who is responsible for monitoring?

There are three immediate options for who should be responsible for monitoring global governance and holding stakeholders to account, and the IACG must provide a clear recommendation to the Secretary General ahead of September 2019 UNGA:

- The first would involve establishing an independent, small secretariat, hosted by the UN Secretary-General and involving a collaboration between supportive national governments, philanthropic organizations and academic institutions.
- The second would involve the development of a new initiative governed by a multi-stakeholder board (including members of the UN tripartite), which could operate as a trust fund (with the World Bank as the fiduciary agent). It would be established with a clear problem-based mandate (similar to both the Global Fund & GAVI) with transparency in its operations.
- The third would involve the creation by the UN Secretary-General of a new coordinating initiative to become the AMR focal point of the multilateral system and work with countries to align national strategies.
- *In all the above options, the development of a One Health Scientific Advisory Committee is advisable.*

Given the urgency, scale of the challenge, and multisector approach, the second option – a multi-stakeholder board – is most desirable. If this is not immediately viable, the development of option one – a small secretariat – could be recommended, with the hope it would evolve to the second or the third in the medium to long-term (see below).

If we accept that the global governance of AMR is in a ‘start-up’ phase, an interim secretariat can be charged with producing quarterly updates on the progress of the group, for example, between September 2018 and September 2019. These reports should be publicly available, and ideally hosted by the UN SG, to enhance legitimacy and coordinating power across UN agencies.

Where is the funding coming from?

The evolution of the Global Fund demonstrates one pathway to creating a new global governance institution. In that case, the issue began in a G8 summit, and was then taken forward by the UN Secretary-General Kofi Annan at the African leader’s summit and the development of a “war chest”, the UNGA then had a special session discussion, and the issue then reverted back to the G8 whose members made more specific commitments. One lesson here is that commitments to funding preceded the development of a secretariat or board not the other way around. As such, the IACG should consider developing recommendations towards a replenishment mechanism that receives voluntary contributions from governments, individuals, businesses, and private foundations. The success of this approach can be seen through both the Global Fund and Gavi. In addition, the IACG should consider the value of of an innovative financing mechanism, such as that implemented by Gavi, or more recently by the World Bank when developing innovative insurance-based mechanisms comprising insurance and cash windows for the Pandemic Emergency Financing Facility.¹²⁹

¹²⁹ Pandemic Emergency Financing Facility (PEF): Proposed Financing From IDA, Development Finance Vice-Presidency and Human Development Vice-Presidency, 2017 Apr 19 [cited 2018 Apr 10] available from: <http://documents.worldbank.org/curated/en/176611494727224133/pdf/IDA-Financing-for-PEF-April-19-2017-04202017.pdf>

Post-September 2019:

Following the Secretary General's report to the UNGA and Member States in September 2019, it is hoped that a mandate will be given to implement and action the governance model of AMR. Other long-term functions that could be added to support the operations a board could include:

- The expansion of a Multilateral Fund for the implementation of the model, monitored by an Executive Committee of the board, with equal representation of government and non-government representatives, including members of the UN tripartite. If endorsed by the UNGA, this may be selected annually by a Meeting of the Parties, and tasked to report annually to the Meeting of the Parties on its operations.
- The work of the Multilateral Fund could be carried out by the members of the Tripartite, or, an alternate agency that has contractual agreements with the Executive Committee.
- The continuation of a One Health Scientific Advisory Committee and/or development of a Technology and Economic Assessment Panel to support the board to reach decisions on complex matters.

Monitoring against the SDG agenda:

In parallel to internal mechanism for monitoring progress on global governance, external mechanisms must also be considered and developed. Alongside any one of the above scenarios, a further way forward is to include AMR into global plans to achieve the SDGs. For example, given that AMR is a global issue, it has the potential to both contribute to and benefit from global efforts aimed at making the SDGs a reality. At the moment, a limited number of SDG goal indicators can be used to monitor progress on the animal consumption of antimicrobials. However, many animal relevant indicators exist that are critical for the achievement of the SDGs that require both the goal itself and AMR to be considered. For instance, SDG 2.3 calls for the doubling of agricultural productivity by 2030 while ensuring the implementation of sustainable food production systems and resilient agricultural practices, which would likely require a strategy involving the consideration of antimicrobial use in order to mitigate inappropriate use of antimicrobials in achieving this goal (see Appendix 3). This may also create the space for civil society to become further involved (e.g. Global Health Watch or the former Global Governance Tracker).

It is important to note that minor revisions to the SDGs are only possible during annual reviews every April, and comprehensive reviews are not until 2020 and 2025. Any change will require significant political mobilisation, and given the short time frame, other monitoring options seem more viable.

5. Appendices

Appendix 1 – Summary of G20 and G7 AMR declarations^{130 131}

Group	Meeting	Pledges
G20	Berlin Germany, 2017	<ul style="list-style-type: none"> • Endorsed the Global Action Plan as the blueprint for action and the leadership of the WHO-OIE-FAO tripartite as well as the IACG. • Committed to each developing National Action Plans with implementation well underway by the end of 2018 while offering support to other countries. • Committed to strengthening national and regional surveillance and monitoring of AMR and antibiotic consumption while contributing to WHO GLASS and helping other countries improve their capacity. • Committed to raising awareness and promoting stewardship on AMR across stakeholders. • Endorsed certain programmes - GARDP, DNDi, JPIAMR, IMI, UNITAID, CARB-X, and the TB Alliance. • Committed to supporting initiatives on: infection prevention and control; water, sanitation, and hygiene; vaccination; stewardship in human and animal health; research and development for new therapeutics, vaccines, and diagnostics. Specific support was given to the G20 Agriculture Ministers' Declaration and Action Plan, the WHO End TB Strategy, and the WHO Global Framework for Development and Stewardship.
G7	Elmau and Berlin, Germany, 2015	<ul style="list-style-type: none"> • Committed to developing National Action Plans in line with the requirements of the Global Action Plan that integrates a One Health approach. • Committed to supporting other countries to develop and implement National Action Plans coordinating activity through the WHO-OIE-FAO tripartite. • Committed to establishing and extending national and regional surveillance systems to support WHO GLASS as well as FAO and OIE surveillance mechanisms. • Committed to promoting a global network of researchers; experts from academia, industry, healthcare, veterinary care, regulatory agencies, food safety and agriculture, philanthropies, and NGOs. • Committed to exploring the feasibility of setting up a global antibiotic product development partnership for therapeutics and diagnostics in collaboration with DNDi. • Committed to exploring innovative economic incentives for research of new therapeutics and diagnostics. • Committed to supporting initiatives and putting effort into: infection prevention and control, raising awareness, promoting antibiotic stewardship in human and animal medicine, improving quality of medicines, promoting the development of new therapeutics/vaccines/diagnostics, international cooperation on stewardship and regulatory dialogue, and research. • Share best practices and promote prudent AMR use. Best practices noted in <i>Combating Antimicrobial Resistance – Examples of Best-Practices of the G7 Countries</i>.

Appendix 2 – Bringing agriculture into the picture

Given that agriculture is one of the key drivers of AMR, it is essential that it is addressed alongside human health and the environment through a one health approach. Due to its relative lack of global attention in comparison to human health, its strong evidence base, and less mature governing mechanisms, it requires special attention.

(a) Livestock rearing, crop production, and aquaculture

Agriculture, for the purposes of this report, refers to practices inclusive of livestock rearing, crop production, and aquaculture. A report conducted by the Review on AMR highlighted the importance of understanding the relative contributions of these separate practices, noting that

¹³⁰ G20.(2017). *Berlin declaration of the G20 Health Ministers*. G20. Available from: https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/3_Downloads/G/G20-Gesundheitsministertreffen/G20_Health_Ministers_Declaration_engl.pdf [Accessed 13 March 2018].

¹³¹ G7. (2015). *Declaration of the G7 Health Ministers*. G7. Available from: https://www.bundesgesundheitsministerium.de/fileadmin/Dateien/3_Downloads/G/G7/G7_Health_Ministers_Declaration_AMR_and_EBOLA.pdf [Accessed 13 March 2018].

livestock is the greatest concern to date given the high levels of antibiotic use in food-producing animals:

- In many countries, more than 50% of medically important antibiotics consumed are used in livestock.¹³²
- Aquaculture is a similarly concerning but less well understood area. Antibiotics in fish feed can leave residues in food products but can also remain in the aquatic environment for long periods – some 70-80% of antibiotics given to fish are suggested to be excreted into water, but given the lack of evidence and data in this area, more information is needed.^{133,134}
- Finally, antimicrobial use in crop production is thought to be relatively low in comparison to that used in livestock accounting for only 0.2-0.4% of total agricultural antibiotic consumption; however, crop practices should not be ignored given that current evidence is not sufficient to exclude large potential impacts on antimicrobial resistance.¹³⁵

(b) The global use of antibiotics in agriculture (and trends)

The procurement of data at a country and regional level is, as expected, a process filled with limitations given a) the lack of data availability b) poor monitoring and surveillance systems and c) access, privacy and confidentiality concerns among other issues. Nevertheless, two methods for quantifying current and projected use are observed and discussed at length below. To summarize, on a regional level, it appears that the areas of highest absolute use of antimicrobials are the Americas and Europe.¹³⁶ On a country-level basis, four countries – Brazil, China, India, and the United States accounted for almost 50% of global usage with the areas of highest projected growth being in Myanmar, Indonesia, Nigeria, Peru, and Vietnam.¹³⁷

The first method, conducted by the OIE (2017), is a process that collected survey data on antimicrobial use in animals and aquatic organisms from member and non-member countries between 2013 and 2016 using 2014 as the main year to model given its optimal data quality. In that year, 62 countries submitted quantitative data, all of which were Member States, but two countries were excluded for confidentiality reasons. The data from these countries was then abstracted to the regional level and adjusted by animal biomass and estimated data coverage of that country.

¹³² O'Neill, J. (2015).

¹³³ O'Neill, J. (2015).

¹³⁴ BurrIDGE L., Weis J.S., Cabello F. et al. (2010). Chemical use in salmon aquaculture: A review of current practices and possible environmental effects. *Aquaculture*, 306, (1- 4), 7-23. doi.org/10.1016/j.aquaculture.2010.05.020; Serrano P.H. (2005). *Responsible use of antibiotics in agriculture*, *FAO Fisheries Technical Paper*. FAO. Available from: <http://www.fao.org/3/a-a0282e.pdf> [Accessed 5 March 2018].

¹³⁵ O'Neill, J. (2015).

¹³⁶ World Organisation for Animal Health (OIE). (2017). *Annual report on antimicrobial agents intended for use in animals, better understanding of the global situation*. World Organisation for Animal Health (OIE). Available from: http://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/AMR/Annual_Report_AMR_2.pdf [Accessed 22 March 2018].

¹³⁷ Van Boeckel T.P., Brower C., Gilbert M., Grenfell B.T. et al. (2015). Global trends in antimicrobial use in food animals. *PNAS*. 112(18), 5649-54. doi: [10.1073/pnas.1503141112](https://doi.org/10.1073/pnas.1503141112).

Table 1: Reported quantity of antimicrobial agents intended for use in animals, adjusted for estimated coverage of data collection and animal biomass, for 2014¹³⁸

OIE Region	Number of Countries Reporting Quantitative Data	% of Total Estimated Biomass	Quantities Reported (in tonnes)	Quantities Reported (in tonnes) adjusted by Estimated Coverage	Antimicrobial Quantities Adjusted for Animal Biomass (and Estimated data Coverage) (mg/kg)
Africa	13	41%	3869	4279	63.33 (70.04)
Americas	11	86%	26 271	40 759	104.03 (160.69)
Asia and the Pacific	5	6%	3396	3 833	228.47 (257.85)
Europe	31	71%	8891	9 220	88.99 (89.78)
Total	60	47%	42 427	57 911	

The second method was deployed by Van Boeckel *et al.* (2015), which maintained a country-level focus rather than a regional approach, used Bayesian statistical models that combined variables such as livestock densities, economic projections of meat product demand, and estimates of antimicrobial consumption to demonstrate use of antimicrobials in food animals for 2010 and predictions for 2030.¹³⁹ In this analysis, four countries – Brazil, China, India, and the United States accounted for almost 50% of global usage.¹⁴⁰

Table 2: Countries with major shares of global antimicrobial consumption in food animal production in 2010 and projections for 2030¹⁴¹

Country	Share of Global Antimicrobial Consumption on Food Animal Production – 2010	Share of Global Antimicrobial Consumption on Food Animal Production – 2030
China	23%	30%
United States	13%	10%
Brazil	9%	8%
India	3%	4%

In the same report, of the 50 countries with the largest amounts of antimicrobials used in agriculture in 2010, the five countries with the fastest projected growth include:

- Myanmar 205%
- Indonesia 202%
- Nigeria 163%
- Peru 160%
- Vietnam 157%.¹⁴²

Geographic hotspots exist that are particularly concerning for the way antimicrobials are used.¹⁴³ For instance:

- In South Asia and Southeast Asia antimicrobial consumption hotspots occurred on the southeast coasts of China, in Guangdong and Sichuan provinces, the Red River delta in Vietnam, the northern suburbs of Bangkok, and the south coast of India as well as in Mumbai and Delhi;

¹³⁸ World Organisation for Animal Health (OIE). (2017). *Annual report on antimicrobial agents intended for use in animals, better understanding of the global situation*. World Organisation for Animal Health (OIE). Available from:

http://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/AMR/Annual_Report_AMR_2.pdf [Accessed 22 March 2018].

¹³⁹ Van Boeckel T.P., Brower C., Gilbert M., Grenfell B.T. et al. (2015). Global trends in antimicrobial use in food animals. *PNAS*. 112(18), 5649-54. doi: [10.1073/pnas.1503141112](https://doi.org/10.1073/pnas.1503141112).

¹⁴⁰ Ibid.

¹⁴¹ Ibid.

¹⁴² Ibid.

¹⁴³ Ibid.

- In the Americas, high consumption areas included the south of Brazil, the suburbs of Mexico City, and the Midwest and southern United States;
- In Africa, the only notable hotspots appeared to be the Nile delta and Johannesburg and its surrounding areas.¹⁴⁴

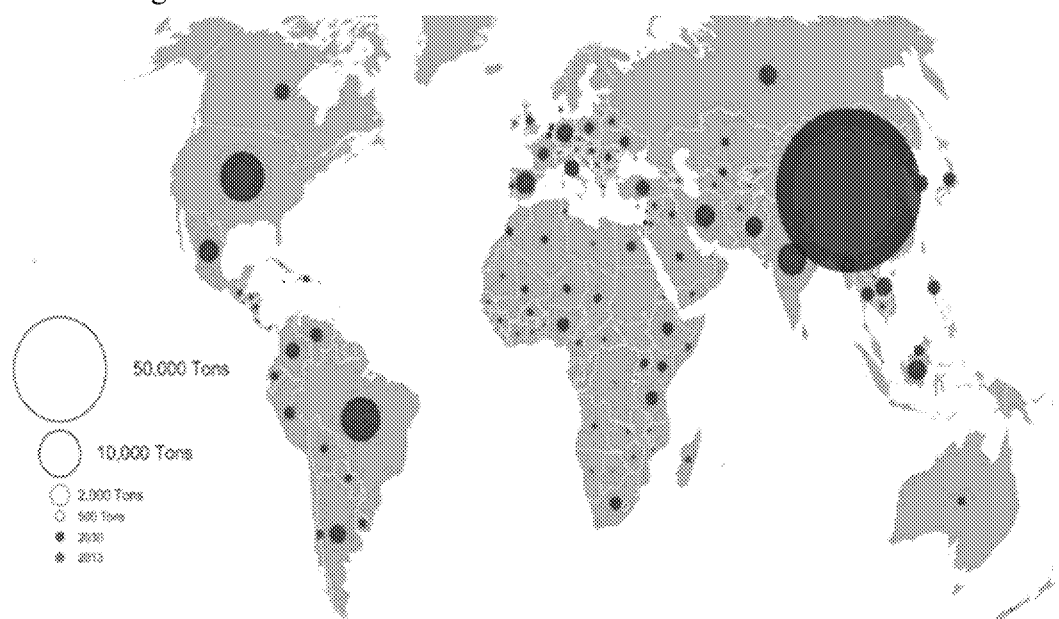


Figure 2. Consumption of antimicrobials in food animals in 2013 (light red) and projected for 2030 (dark red) (Van Boeckel et al., 2017).

In general, the antimicrobials market for animal use is expected to grow at a compounded annual growth rate (CAGR) of 4.6% between 2016 and 2021 to reach 4.73 billion USD by 2021.¹⁴⁵ This growth is attributed to factors such as a growing animal population, rising animal healthcare expenditures, growing demand for animal-derived food products, and rising awareness of zoonotic diseases.¹⁴⁶ The market in the Asia-Pacific region is expected to grow at the highest CAGR due to the growing animal population, increasing demand for animal-derived food products, rising awareness of animal health and welfare, and growing per capita animal health expenditure, especially in India and China.¹⁴⁷ However, not all areas are expected to have increases in use. For instance, in 24 European Union (EU) countries, agricultural consumption of antimicrobials has decreased by 12% between 2011 and 2014 and is expected to continue as alternative practices are used, as biosecurity and nutrition improves, and as awareness of the downsides of AMR increases.¹⁴⁸

¹⁴⁴ Ibid.

¹⁴⁵ Markets and Markets. (2018). *Animal antibiotics and antimicrobials market by product (tetracycline, penicillin, sulfonamide, macrolide, cephalosporin, fluoroquinolone), mode of delivery (premixes, oral powder, injection), animal (food-producing & companion) - Global Forecast to 2021*. Available from: <https://www.marketsandmarkets.com/PressReleases/animal-antimicrobials-antibiotics.asp> [Accessed 22 Mar 2018].

¹⁴⁶ Markets and Markets. (2018).

¹⁴⁷ Ibid.

¹⁴⁸ OECD. (2016). *Antimicrobial resistance*. OECD. Available from: www.oecd.org/health/health-systems/AMR-Policy-Insights-November2016.pdf [Accessed 22 March 2018].

(c) Alternative agricultural practices could be substituted for antibiotics

To mitigate the issue of agricultural antimicrobial use, alternatives are needed to compensate for a) any potential loss of animal growth and b) adverse animal health outcomes that may result from reduced use of antimicrobials in food production. Ideal alternatives should generate similar benefits to antibiotics while also being safe and well-understood.

Though many alternatives have multiple functions, they can be considered in two major groups:

- **growth promoter alternatives** including in-feed enzymes, probiotics, prebiotics, antimicrobial peptides, and other chemicals and metals.
- **disease prevention and treatment alternatives for food hygiene and biosecurity** including vaccines, immune modulators, and bacteriophages, endolysins, and hydrolases.

The alternatives with the strongest evidence appear to be probiotics and vaccines, which are both widely used.¹⁴⁹ Prebiotics, in-feed enzymes, and immune modulators follow these in terms of the quality of supporting evidence. Evidence gaps are sourced from three key areas which have been well-elaborated by the Pew Charitable Trusts:¹⁵⁰

- Firstly, the efficacy of alternative products tends to vary in the literature across different settings and understanding why this is the case is important for quantifying the true effects and determining how those can be maximized. To successfully accomplish this aim, the importance of factors such as weather, animal type, feed composition, and the microbiome will need to be delineated.
- Secondly, although evidence for some substitutes exists, the mechanism of action for many of these products is poorly understood. In order to determine the safety of the method and feasibility of substitution, understanding the molecular processes by which an effect is achieved, and surrounding interactions is important, including the possibility of unintended consequences.
- Finally, the financial case needs to be determined, as cost-effectiveness will determine the true potential for substitution. Further data from experimental studies will need to be better developed for future decision-making.

A summary of the evidence is available in *Figure 2* (next page) with a detailed summary in Appendix 3.

¹⁴⁹ The Pew Charitable Trusts. (2017). *Alternatives to antibiotics in animal agriculture*. The Pew Charitable Trusts. Available from: http://www.pewtrusts.org/~media/assets/2017/07/alternatives_to_antibiotics_in_animal_agriculture.pdf [Accessed 10 March 2018].

¹⁵⁰ The Pew Charitable Trusts. (2017).

Alternatives to Antibiotics for Use in Animal Agriculture

Efficacy of products varies across animal species and reason for use

	Cattle			Swine	Chicken ¹	Turkey
	Milk-fed calves	Dairy cows	Beef cattle			
Probiotics	●●	●●	●●○	●○○	●●	●●
Prebiotics	○○	○	○	○○	●●	●●
Organic acids		○○	○○	●○	●●	○○
In-feed enzymes		○	○	●○	●●	●
Antimicrobial peptides	○○	○○○	○	○○	○○	
Phytochemicals (e.g., essential oils)	○○○	○	○	○○	●○	○○
Copper, zinc, and other heavy metals	●*	○○*	●○*	●○	●	○
Immune modulators	●	●*	●	○○○	○○	○○
Vaccines	●	●	●	●●	●	●
Bacteriophages, endolysins, lysozyme, and other hydrolases	○	○○		○○○	○○	○○

● Growth promotion, strong scientific evidence for efficacy and commercially used	○ Growth promotion, some scientific evidence suggests potential efficacy
● Disease prevention, strong scientific evidence for efficacy and commercially used	○ Disease prevention, some scientific evidence suggests potential efficacy
● Disease treatment, strong scientific evidence for efficacy and commercially used	○ Disease treatment, some scientific evidence suggests potential efficacy
○ Evidence suggesting lack of efficacy	

Notes:
Full colors represent strong scientific evidence for efficacy (i.e., based on meta-analysis, systematic review, or review by authoritative organizations such as the Food and Agriculture Organization of the United Nations) and commercially used; also included in this category are products that have market approval as drugs or biologics because efficacy has to be demonstrated as part of the approval process for these products.

Figure 2. Summary of Evidence on Antibiotic Alternatives in Agriculture (The Pew Charitable Trusts, 2017)

(d) The experience of the EU

Bans on antimicrobial use are not new in the European region – they date back to the 1970s after the Swann Committee recommended the restriction of Antimicrobial Growth Promoters (AGPs).¹⁵¹ Subsequent bans, such as the 1986 ban in Sweden and the Denmark bans in 1995 and 1998 demonstrated their potential for reducing antimicrobial use, however, concerns about animal health and welfare were raised. In addition, these bans had negative economic consequences for farmers although evidence from the UK argues against potential economic losses.¹⁵² In the UK, the British Poultry Council found that a 71% reduction of antibiotic use

¹⁵¹ Coglian, C., Goossens, H. & Greko, C. (2011). Restricting antimicrobial use in food animals: lessons from Europe. *Microbe*. 6 (6), 274-279. Available from: http://emerald.tufts.edu/med/apua/about_us/publications_21_3573465644.pdf [Accessed 22 March 2018].

¹⁵² Casewell M., Friis C., Marco E., McMullin P. et al. (2003). The European Ban on Growth-Promoting Antibiotics and Emerging Consequences for Human and Animal Health. *Journal of Antimicrobial Chemotherapy*. 52, 159-61. doi: 10.1093/jac/dkg313.

by weight from 2012-2016 co-existed with an 11% increase in poultry meat production in the same year.¹⁵³

Still, clear successes are not observed everywhere. In the Netherlands, attempts at reducing AGPs were diluted due to the lack of an ability to prevent farmers from simply classifying non-therapeutic use as therapeutic use, the lack of government enforcement of measures, and the lack of appropriate monitoring and disease control.¹⁵⁴ To be more successful, bans need to be accompanied by other interventions such as surveillance and monitoring, enforcement, and awareness.

The culture of antimicrobial bans has continued in Europe and in 2006, the EU banned the use of all antibiotics for growth promotion due to consumer and political pressure, scientific evidence, and the moral imperative to act instantiated by the ‘precautionary principle’.¹⁵⁵ A review conducted by the European Medicines Agency (EMA) in partnership with the European Food Safety Authority (EFSA) attempted to assess the impacts of the ban and other potential measures uncovering favourable results and identified best practices. These include:

- Having **high-level reduction targets in national strategies**;
- **Reducing the use of antimicrobials** in animals to the minimum necessary, and if possible, replacing them with alternatives;
- **Measuring antimicrobial use** at the farm-level and benchmarking;
- **Strengthening controls** on group treatments;
- **Requiring antimicrobial susceptibility** testing prior to use of high priority antimicrobials;
- **Having legislative and voluntary industry sector restrictions**;
- **Rethinking the livestock system** by implementing farming practices to prevent the introduction and spread of disease;
- **Conducting further research** in areas of diagnostics, therapeutics, vaccines, alternatives, and systems approaches; and
- **Providing supportive measures** such as guidelines.¹⁵⁶

Though the report could not quantify the impact of single reduction measures and alternatives due to the complexity of identifying causal effects, it concluded that a general decrease in resistance is reasonable to assume.¹⁵⁷ Other key elements of the EU’s approach include:

- Having the **EMA be a central body responsible** for monitoring and evaluating the risk of antibiotic use in animals and its transmission to humans. They are also a main point of contact for quality defects, investigations, sampling and testing, and harmonizing EU-wide activities.
- **Collaboration between the EMA and EU international partners** as well as the **private sector**.

¹⁵³ Griffiths, R. (2017). *British poultry’s successful stewardship on antibiotic use*. Available from: www.britishpoultry.org.uk/british-poultrys-successful-stewardship-on-antibiotic-use/ [Accessed 7 April 2018].

¹⁵⁴ Coglian, C., Goossens, H. & Greko, C. (2011).

¹⁵⁵ Casewell M., Friis C., Marco E., McMullin P. et al. (2003).

¹⁵⁶ European Medicines Agency (EMA) and European Food Safety Agency (EFSA). (2016). EMA and EFSA joint scientific opinion on measures to reduce the need to use antimicrobial agents in animal husbandry in the European Union, and the resulting impacts on food safety (RONAFA). EFSA Journal. 15(1). doi: 10.2903/j.efsa.2017.4666.

¹⁵⁷ European Medicines Agency (EMA) and European Food Safety Agency (EFSA). (2016). EMA and EFSA joint scientific opinion on measures to reduce the need to use antimicrobial agents in animal husbandry in the European Union, and the resulting impacts on food safety (RONAFA). EFSA Journal. 15(1). doi: 10.2903/j.efsa.2017.4666.

- The **development of an action plan** by the European Commission on **targeting the rising threats of AMR** with EMA support.
- **Requiring companies to comply with legislation and enforcing action with national-authority** run inspections (both routine and for cause) on their activities both within and outside the EU market.^{158,159}

Finally, the EU experience demonstrates that there is no magic wand available. A suite of interventions that is centrally coordinated, promotes international collaboration across sectors, and includes clear goals that are legally enforced are all necessary components of effective regulation.

¹⁵⁸ European Medicines Agency (EMA). (2018). *Compliance*. EMA. Available from: http://www.ema.europa.eu/ema/index.jsp?curl=pages/regulation/general/general_content_001798.jsp&mid=WC0b01ac0580b2d7ba [Accessed 22 March 2018].

¹⁵⁹ European Medicines Agency (EMA). (2018). *Recommendations on the use of antibiotics in animals*. EMA. Available from: http://www.ema.europa.eu/ema/index.jsp?curl=pages/regulation/general/general_content_000639.jsp&mid=WC0b01ac058080a585 [Accessed 22 March 2018].

Appendix 3 – Summary of evidence on selected antibiotic alternatives in agriculture

Table 3: Summary of evidence on selected antibiotic alternatives in agriculture¹⁶⁰

Alternative	Evidence
Alternatives for Growth Promotion	
In-feed Enzymes	<p>Enzymes that can be added to animal feed to help them break down plant materials and digest.</p> <ul style="list-style-type: none"> Some enzymes are already used as growth promoters in practice. Favourable results have been observed in chickens (e.g. in one study, a 2-5% improvement in feed efficiency); more variable in pigs. Less good for cattle since a portion of their stomach inactivates enzymes before they reach the gut. Problems? Mechanisms behind effectiveness not fully understood, efficacy varies across animals, results variable.
Probiotics	<p>Live cultures of microorganisms that are added to feed to improve gut flora. Can be of single strains or mixes.</p> <ul style="list-style-type: none"> Already widely used and studied by FAO, strong supportive evidence overall. Co-benefits of disease prevention in addition to growth promotion. Good evidence in chickens, pigs, and cattle for both productivity (e.g. in one study, led to a weight gain of over 7% in piglets after weaning) and health. Problems? Storage of probiotics is challenging due to heat inactivation; some potential unintended effects are possible on gut flora since live cultures are being administered.
Prebiotics	<p>Certain types of sugars that are indigestible by animals but can be broken down by certain beneficial microorganisms thus stimulating their selective growth.</p> <ul style="list-style-type: none"> Varied efficacy, not as strong as probiotics. Used already as well with potential for both health and growth effects. Problems? Varied study efficacy, heavily dependent on animal type and context.
Antimicrobial Peptides	<p>Short protein-based molecules that have antibacterial properties.</p> <ul style="list-style-type: none"> Good supportive evidence in chickens, piglets, and cattle, but variable efficacy. Problems? Variability, different mechanisms of action, potential for resistance emergence.
Others	<p>Many – organic acids, phytochemicals, zinc, copper, other heavy metals.</p> <ul style="list-style-type: none"> Some supportive evidence, but variability in efficacy
Alternatives for Disease Prevention and Treatment	
Vaccines	<p>Most widely used and promising alternative.</p> <ul style="list-style-type: none"> Primarily for disease prevention, although some studies suggest co-benefits on growth rates and animal performance. Many vaccines are available and studies have shown their ability to reduce disease. Problems? Narrow range of coverage, cost (especially if injections are needed).
Immune Modulators	<p>Antibodies and other immune-altering substances that affect the immune system's ability to fight infections.</p> <ul style="list-style-type: none"> Strong preliminary meta-analysis supportive evidence in chickens and pigs on specific types of modulators and for specific infections. In the US, 2 have been approved in cattle – one for udder infections and the other for respiratory disease. Problems? Relies on a functioning immune system (thus challenging in young animals); safety concerns on use before the immune system is fully developed; mechanisms rarely well determined.
Bacteriophages, Endolysins, Hydrolases	<p>Viruses and enzymes they generate. Bacteriophages are viruses that infect and kill bacteria; endolysins and lysozymes degrade a critical component of bacteria – their cell wall.</p> <ul style="list-style-type: none"> Bacteriophages: used for disease prevention and treatment with good results in chickens, piglets, and calves to reduce diarrhea-associated bacteria. Major issues? Bacteriophages have narrow targets, are time-sensitive, require good diagnostics, and can be inactivated. <i>They can also cause resistance.</i> Endolysins and lysozymes have scarce data behind them along with particular issues such as narrow targets and potential adverse effects.

¹⁶⁰ The Pew Charitable Trusts. (2017).

Appendix 4 – Summary of reports on AMR

Paper	Authoring Body	AMR Focus Area of the Document	Key Institutions and Stakeholders*	Proposed Solutions
<i>Global Action Plan</i>	WHO	Outlines the World Health Assembly global action plan adopted for antimicrobial resistance. The plan is sourced from a one health perspective and covers human health, agriculture, and the environment.	Tripartite collaboration (WHO, FAO, OIE), Member States, World Bank, international and national partners.	<ul style="list-style-type: none"> Improve awareness and understanding of antimicrobial resistance through effective communication. Strengthen knowledge and evidence base through surveillance and research. Reduce the incidence of infection through effective sanitation, hygiene, and infection prevention measures. Optimize the use of antimicrobial medicines in human and animal health. Develop the economic case for sustainable investment that takes account of the needs of all countries and increase investment in new medicines, diagnostic tools, vaccines, and other interventions.
<i>Antimicrobials in Agriculture and the Environment: Reducing Unnecessary Use and Waste</i>	Review on Antimicrobial Resistance	Highlights the role of global food production and environmental damage in contributing to AMR.	Tripartite collaboration (WHO, FAO, OIE), Member States.	<ul style="list-style-type: none"> Global reduction target for types of antimicrobials and for dose/kg. Minimum standards to reduce manufacturing waste environmental release. Surveillance for monitoring AMR in food production and the environment along with progress on global targets.
<i>Antimicrobial Resistance Framework for Action Supported by the IACG</i>	IACG	Integrates various priorities -- across the UNGA political declaration, Sustainable Development Goals, and Global Action Plan -- into a framework for action.	Tripartite collaboration (WHO, FAO, OIE), UNGA, Member States.	<p>Proposes a 3-pronged strategy involving:</p> <ul style="list-style-type: none"> Reducing need and unintentional exposure through human and animal infection prevention and control, water and sanitation, food safety, and environmental protection. Optimizing use of medicines in human and animal use and through laboratory capacity and surveillance. Investing in innovations, supply, and access through research and development, specifically in diagnostics, vaccines, and therapeutics of high quality. <p>To achieve these aims, overarching needs include:</p> <ul style="list-style-type: none"> Surveillance and best practice improvements and sharing. Funding priorities and mechanisms for coordinated investment. Policy and regulation for minimum standards that are facilitated through sustainable national action. Awareness and capability building. Creation and implementation of a global roadmap.
<i>Antimicrobial Resistance – A Global Epidemic</i>	WHO, WIPO, WTO	Summarizes the general issue of what AMR is, how it came to be, what its drivers are, and methods to target it in an overview document.	Tripartite collaboration (WHO, FAO, OIE), WTO, Member States.	<ul style="list-style-type: none"> Stewardship through responsible resource management, quality assurance audits, and improving regulation. Innovation specifically in diagnostics, therapeutics, and incentives for further research and development. Access promotion in areas that do not currently have antimicrobial access, but in conjunction with responsible use. Law mechanisms through trade that can support implementation of international standards. Awareness building on the overall AMR issue.
<i>The OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials</i>	OIE	Outlines the OIE Strategy on AMR based on a one health perspective with a focus on animal health.	Tripartite collaboration (WHO, FAO, OIE).	<ul style="list-style-type: none"> Awareness raising on the nature of the AMR problem and its relationship to animal health through communication and advocacy. Surveillance and research to strengthen knowledge and to be implemented through national action. Governance and capability building for proper antimicrobial use and preventing resistance, which includes veterinary training interventions. International standards and the promotion of good practice on production, circulation, monitoring, and animal use of antimicrobials.
<i>The FAO Action Plan on Antimicrobial Resistance</i>	FAO	Outlines the FAO Action Plan on AMR based on a one health perspective with a focus on food and agricultural systems.	Tripartite collaboration (WHO, FAO, OIE), Member States.	<ul style="list-style-type: none"> Awareness on antimicrobial resistance and related threats. Surveillance and monitoring of AMR in food and agriculture. Governance strengthening related to improving antimicrobial use practices in food and agriculture. Good practice promotion of prudent use of antimicrobials in food and agricultural systems.
<i>Drug-Resistant Infections: A Threat to Our Economic Future</i>	World Bank	Focuses on the global economic and development consequences of AMR with a focus on aspects relevant to low- and middle-income countries, specifically including laboratory surveillance and human and animal antimicrobial use.	Tripartite collaboration (WHO, FAO, OIE), Member States.	<ul style="list-style-type: none"> Surveillance and monitoring capable of driving response action that is coordinated with other health issues and accompanied by national targets for reduction and international standards. International cooperation and collective action to monitor, regulate, and reduce antimicrobial use and to serve as a platform for financing. Incentive promotion and financing mechanisms to achieve optimal practices in the agriculture and aquatic sectors. Research and consensus on measures to contain AMR. Sector-specific recommendations for human and animal antimicrobial use and laboratory surveillance.

*Other important actors discussed in the reports include: health authorities (incl. veterinary bodies), industry players and their representative bodies (agriculture, aquaculture, pharmaceutical and biotechnology), regulators, public and private organizations, multilateral/private/government funders, financial planners, academia and research institutions, civil society, and consumers.

Appendix 5 – Models of governance within and beyond health

Design elements	Stakeholders	Regulatory options available when system was developed	Setting of norms/rules	Behaviour monitoring/surveillance/ reporting	Adjudication of infringements	Enforcement and success	Lessons for global governance of antimicrobials
<i>Intergovernmental</i>							
Framework Convention on Tobacco Control (FCTC) ¹⁶¹	<p>Member states of the World Health Organization: The FCTC was first drafted and tabled at 95th World Health Organization (WHO) Executive Board in 1995, but was not adopted by 192 Member states until 2003.</p> <p>180 states have now signed and are Parties to the Convention.</p>	<p>Alternatives to the FCTC, and the related protocols to promote global cooperation and national action for tobacco, – include:</p> <p>a) WHO Code of Conduct on tobacco control (akin to the WHO International Code of Marketing Breast Milk Substitutes);</p> <p>b) nonbinding international instrument that could be adopted by the World Health Assembly as a resolution; or</p> <p>c) a treaty to be adopted under the auspices of the United Nations.</p>	<p>The first international treaty adopted under the auspices of WHO gave ‘priority to [WHO’s] right to protect public health’. It requires state parties to:</p> <p>a) implement restrictions on advertising, sponsorship, and promotion;</p> <p>b) implement strong packaging and labelling requirements;</p> <p>c) establish clean indoor air controls and strengthen legislation to combat tobacco smuggling;</p> <p>d) adopt price and tax measures; and</p> <p>e) test, measure and regulate the contents and emissions of tobacco products.</p> <p>Article 5, <i>General Obligations</i>, requires Parties to establish essential infrastructure for</p>	<p>The Conference of Parties (COP) is the governing body of the WHO FCTC and is comprised of all Parties to the Convention. COP is responsible for global progress reports, and the implementation database maintained by the Convention Secretariat.</p> <p>Under Article 20, Parties undertake to establish and strengthen surveillance for tobacco control and to promote exchange of information in relevant fields.</p> <p>Under Article 21, parties are required to submit to the COP, through the Convention Secretariat,</p>	<p>COP regularly reviews and promotes the implementation of the FCTC, and adopts protocols, annexes, decisions and amendments in the FCTC.</p> <p>Parts IX-X of the FCTC covers settlement of disputes and development of the FCTC; amending the FCTC; withdrawal; right to vote; adoption of protocols; and the procedures for acceding to the FCTC and for its entry into force.</p>	<p>Under Article 19, Parties agree to consider taking legislative action or promoting their existing laws to deal with liability, and to provide each other with assistance in legal proceedings relating to liability (as appropriate and mutually agreed) presenting Parties with an opportunity to collaborate in their efforts to hold the tobacco industry liable for its abuses.</p> <p>Between 2005 and 2015, more than 130 parties that ratified the Convention had either strengthened their tobacco control legislation before they ratified the treaty, or have adopted new, treaty</p>	<p>FTCT as a regulatory catalyst: The FCTC demonstrated its potential to act as a global complement to regional, national and local action for tobacco control. Even before the treaty was adopted, while the negotiations were in process, a number of governments took action to strengthen their legislation and programmes on tobacco control.</p> <p>Importance of economic alternatives for successful regulation: Under Article 17, <i>provision of support for economically viable alternative activities</i>, Parties are obligated – in cooperation with each other and with competent intergovernmental organizations – to promote economically viable alternatives for tobacco workers, growers and, as the case may be, individual sellers.</p> <p>Litigation as a barrier to regulation:</p>

¹⁶¹ Roemer, R., Taylor, A., & Lariviere, J. (2005). Origins of the WHO Framework Convention on Tobacco Control. *American Journal of Public Health*, 95(6), 936–938. <http://doi.org/10.2105/AJPH.2003.025908> and Eriksen M, Mackay J, Ross H. The Tobacco Atlas, Atlanta, GA: The American Cancer Society. Available from: http://3pk43x313ggr4cy0lh3tctjh.wpengine.netdna-cdn.com/wp-content/uploads/2015/03/TA5_2015_WEB.pdf and The WHO Framework Convention on Tobacco Control: an overview, World Health Organization, January 2015, available from: http://www.who.int/fctc/WHO_FCTC_summary_January2015_EN.pdf?ua=1

* “These legal challenges, which may include invoking economic agreements, are expensive to defeat and invariably delay implementation of laws passed in the interest of public health. For example, in 2011 BAT had 450 people in its regulatory-affairs team involved with aggressive lobbying to prevent plain-packaging within the United Kingdom. The threat of litigation is likely stifling legislative and regulatory affairs in any places.” In The Tobacco Atlas.

		The tobacco industry , opposed a comprehensive treaty, favouring voluntary agreements and regulation by market .	tobacco control , including a national coordinating mechanism, and to develop and implement comprehensive, multisectoral tobacco-control strategies, plans, and legislation to prevent and reduce tobacco use, nicotine addiction and exposure to tobacco smoke. The process must be protected from the interests of the tobacco industry.	periodic reports on implementation of the Convention via a biennial reporting cycle that began in 2012.		compliant legislation .	There were two conflicting position – health over trade, or trade over health. Owing to a lack of consensus, a compromise position eliminating any mention of trade emerged. Now, trade treaties are increasingly being involved to challenge tobacco control policy, as was the case in the introduction of plain/standardised packaging in Australia. Indeed, further legal challenges and threats to alleged commitments to international economic agreements are being invoked to prevent, delay, or overturn tobacco control legislation (see 2014 BAT lobbying*)
Intergovernmental: Montreal Protocol on Substances that Deplete the Ozone Layer ¹⁶²	Member states of the United Nation , research scientists and chemical companies, supported by the development of the Multilateral Fund for the Implementation of the Montreal Protocol . The Technology and Economic Assessment Panel (and its predecessors) to support signatories to reach decisions on complex matters.	Previous alternatives included national spray can bans and subsequent complements include the Kyoto Protocol. In comparison to both, the Montreal Protocol provided an effective burden sharing alternative capable of mitigation regional conflicts and domestic corporate competition; that is US industry “eventually supported international controls, in part because it feared that in the absence of international rules, new domestic rules would	Aimed to ban the global production and use of ozone-damaging chemicals, including CFCs. Trade provisions included in the Montreal Protocol mean signatories can only trade with other signatories. Therefore, once the main producing countries ratified the treaty, other countries had to follow given the increasingly limited supplies of other ozone-depleting substances (ODS). The main objective of the Multilateral Fund is to assist developing country parties to the Montreal Protocol whose annual per capita consumption and production of ozone	The Multilateral Fund has: a) provided incremental funding for developing countries to help meet compliance targets b) provided institutional support to help governments to implement phase-out activities, and c) establish regional networks so the can share experiences and learn from each other.	The Multilateral Fund is managed by an Executive Committee with an equal representation of seven industrialised and seven Article 5 countries, which are elected annually by a Meeting of the Parties. The Committee reports annually to the Meeting of the Parties on its operations. The work of the Multilateral Fund on the ground in developing countries is carried out by	Compliance procedure: designed from the outset as a non-punitive procedure where developing countries – who had become non-compliant – are supported by a UN agency to prepare an action plan to work towards compliance. If necessary, resources from the Multilateral fund are available for short-term projects. Governments could prioritise high-impact intervention early as the chemical and sectors (refrigeration) involved were clearly articulated.	Flexible regulation without scientific consensus: A highly flexible instrument was developed to increase or decrease controls as the science became clearer, which occurred after the initial framework was negotiated. Indeed, early conclusion about the extent of ozone depletion turned out to be significantly under-estimated. This forms the basis of the “ precautionary principle ”. Common, but differentiated, responsibility: in order to protect and manage the global commons, developing countries were given longer to phase-out ODS. Limited source of CFCs: While the number of firms using CFCS was large, production was restricted to a small number of firms, most in industrial

¹⁶² Handbook for the Montreal Protocol on Substances that Delete the Ozone Layer, Ozone Secretariat, UNEP (2018), accessed on 8 March 2018, available from: <http://ozone.unep.org/en/handbook-montreal-protocol-substances-deplete-ozone-layer/25411> and Rae, I. Saving the ozone layer: why the Montreal Protocol worked. The Conversation, Melbourne. 9 Sep 2009, accessed on 8 Mar 2018, available from: <https://theconversation.com/saving-the-ozone-layer-why-the-montreal-protocol-worked-9249>

		weaken its competitive position” ¹⁶³	depleting substances (ODS) is less than 0.3 kg to comply with the control measures of the Protocol.		four Implementing Agencies, which have contractual agreements with the Executive Committee (UNEP, UNDP, UNIDO, World Bank)	All 142 developing countries were able to meet the 100% phase-out mark for CFCs in 2010, and, the ozone layer is expected to return to 1980 levels between 2045 and 2060.	countries. Access to economic alternative: There were benefits for industry of moving away from ODS – CFCs were old technology, and expensive – transition to new, reasonably priced options with no- or lower- depleting potential benefited the industry and environment.
Intergovernmental Panel on Climate Change (IPCC)¹⁶⁴, UNFCCC¹⁶⁵ and the Paris Agreement	The IPCC is an international body established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO), whose governing Panel comprises government members representing 195 Countries , with Assessment Reports produced by a group of scientists and experts . The IPCC Plenary is open to WMO and UNEP member countries, and the IPCC has issued five previous assessments in 1990, 1995, 2001 and 2007 and 2015. Reports inform United Nations climate negotiations. The United National Framework	In the same year of establishment, the UN General Assembly endorsed the action by WMO and UNEP in jointly establishing the IPCC.	Organised into three Working Groups and a Task Force, where two co-chairs and vice-chairs are elected by the Plenary to the IPCC Bureau for a period of 5 to 6 years. All groups have two co-chairs, one from a developed country and one from a developing. Government and other bodies nominate 10-20 potential IPCC authors who are experts in their field. The process of reporting an open, transparent process involving as many relevant parties as possible. The second order draft includes a Summary for Policymakers (SPM) and is sent to governmental panel members for comments. The revised draft is taken into the Working Group Plenary for discussion and approval, and the SMP is discussed and approved line-by-line, and if necessary, word-by-word.	Assessment Reports are produced, and the Task Force refines the methodology for the calculation and reporting of national greenhouse gas emissions and reductions. The Bureau is supported by an IPCC Secretariat , based at the WMO in Geneva, which coordinates all IPCC work and liaises with Governments. The IPCC does not conduct any research, nor does it monitor climate related data or parameters. In the IPCC reports, confidence is expressed qualitatively to describe certainty of scientific findings e.g a ‘very high confidence’ means that there is at least a 9 in 10 chance of a finding being correct. These findings are assessed probabilistically	The role of the IPCC is to provide policy-relevant but not policy-prescriptive advice to policy makers and the general public, hence adjudication of infringements is dependent on responses by nation states and commitments to relevant protocols and treaties e.g United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol and the Paris Agreement.	For more than 20 years the IPCC process has managed to assimilate the rapidly expanding scientific literature about climate change, the interest shown in the IPCC reports illustrates how these Assessments have been useful in trying to keep track of and understand what the science tells us. A case can be made that the IPCC process places great a burden on the climate community in endlessly producing unfunded reports; scientist participation is voluntary and flows of information between groups is difficult. There is no guarantee that IPCC reports will translate to international or national law; one of those missed opportunities was the 2009	An open, transparent and inclusive process can produce a consensus report , but the process also makes it a conservative report; the rational is that the scientists determine what can be said, but governments determine how it can best be said. This is a lengthy process , and it may not be pragmatic to wait six years or so for a report; because of the importance and costs associated with AMR, many of the topics need to be assessed continually. The success of a scientific body is contingent on international negotiations , and there is no guarantee that these will be successful. Any scientific body must be well resourced , avoid technical language and take advantage of new media.

¹⁶³ Hammitt J. THE SUCCESSFUL INTERNATIONAL RESPONSE TO STRATOSPHERIC OZONE DEPLETION. Issues of the Day: 100 Commentaries on Climate, Energy, the Environment, Transportation, and Public Health Policy. 2010 Sep 23:10.

¹⁶⁴ Nicholls N, Explain: what is the IPCC anyway, how does it work? The Conversation. Sep 23 2013 [cited Apr 17 2018] available from:

<https://theconversation.com/explainer-what-is-the-ipcc-anyway-and-how-does-it-work-18164>

¹⁶⁵ Intergovernmental Panel on Climate Change, History. IPCC Intergovernmental Panel on Climate Change. [cited Apr 17 2018] available from:

http://www.ipcc.ch/organization/organization_history.shtml and United Nations Climate Change, About the Secretariat, UNFCCC, [cited Apr 17 2018] available from:

<https://unfccc.int/about-us/about-the-secretariat>

	<p>Convention on Climate Change (UNFCCC) entered into force in 1994, with subsequent adoption of the Kyoto Protocol in 2007 and Paris Agreement in 2017.</p>			<p>using observations, modelling results or expert judgement.</p> <p>The UNFCCC is supported by a 450 staff secretariat, located in Germany, and serves to advance the implementation of the Convention, the Kyoto Protocol and the Paris Agreement. The secretariat provides technical expertise and assists in the analysis and review of climate change information reported by Parties and in the implementation of the Kyoto mechanisms. It also maintains the registry for the Nationally Determined Contributions (NDC), established under the Paris Agreement.</p>		<p>UN summit in Copenhagen, which reached a non-binding accord on actions to cut emissions.¹⁶⁶</p> <p>Other IPCC communication challenges include 1) a lack of resources, over-reliance on technical language and failure to take advantage of new media.</p>	
<i>Co-Regulation</i>							
<p>Extractive Industries Transparency Initiative (EITI)¹⁶⁷</p>	<p>Resource-dependent governments, extractive industry companies, donors, non-governmental organizations and Civil Society Organizations (CSOs)</p>	<p>EITI is a tripartite model of governance between governments, companies and CSOs, which combines voluntary participation, mandatory implementation, and</p>	<p>The objective of the EITI Association is to make the EITI principles and EITI requirements the internationally accepted standards for transparency in the oil, gas and mining sectors.</p>	<p>EITI standards require the implementing countries to disclose revenue flows disaggregated by company and government entity, and to be provided at sub-national level when revenues from companies go to</p>	<p>The EITI requires multi-stakeholder oversights, including functioning multi-stakeholder groups that involve the government, companies, and the</p>	<p>Financial and diplomatic support from donor countries has been encouraged by the EITI International Secretariat to meet the institutional goal of supporting “countries to implement the EITI”.</p>	<p>Time to implement related to theory of change: the actual implementation of the EITI between commitment and candidacy was 2.8 years, and 4.3 years between candidacy and compliance. This demonstrates that a consensus-based approach can be a slow and incremental mode of governance, often requiring a focus on the smallest</p>

¹⁶⁶ United Nations Climate Change, Information provided by Parties to the Convention relating to the Copenhagen Accord, UNFCCC, 18 Dec 2009 [cited 17 Apr 2018] available from: <https://unfccc.int/process/conferences/pastconferences/copenhagen-climate-change-conference-december-2009/statements-and-resources/information-provided-by-parties-to-the-convention-relating-to-the-copenhagen-accord>

¹⁶⁷ Rustad SA, Le Billon P, Lujala P. Has the Extractive Industries Transparency Initiative been a success? Identifying and evaluating EITI goals. Resources Policy. 2017 Mar 1;51:151-62 and EITI, 2016. The EITI Standard 2016. EITI International Secretariat, Oslo. Accessed on: 8 Mar 2018, available from: <https://eiti.org/standard/overview>

		<p>independent validation of extractive sector revenue disclosure for companies and governments.</p> <p>Voluntary alternatives included the Global Reporting Initiative (GRI), the <u>Kimberly Process Certification Scheme</u> (KPCS) against ‘conflict diamonds’.</p> <p>Mandatory approaches include the EU Transparency and Accounting Directives, and 1504 Dodd-Frank¹⁶⁸.</p>	<p>Key goal of increasing revenue transparency through publicly available reports: the EITI Principles were agreed to by a group of countries, companies and civil society organizations at the Lancaster House Conference in 2003 and are considered the cornerstone of EITI.</p> <p>The EITI Requirements include the steps, stipulations and timelines that a country must adhere to in order to become EITI compliant.</p> <p>The Protocol on Civil Society Participation outlines the minimum condition that the civil society must enjoy with regard to participation in natural resource governance management in an EITI implementing country, the goal of recognising and consolidating transparency as a global norm was operationalised by setting up standards for auditing, reporting and involving CSOs in Multi-Stakeholder Groups (MSGs); establishing a MSG is one of the key requirements in order to be accepted as an EITI implementing countries.</p>	<p>subnational government units. It includes requirements to make publicly available information about the exploration activities, licenses and contracts, beneficial owners, rules that govern the management of the extractive sector the fiscal regime the country has adapted for handling the natural resource revenues, production and export volumes and values (by commodity type and region), and how revenues are spent.</p>	<p>“full independent, active and effective participation of civil society.”</p>	<p>Analysts have suggested that one of EITI’s most impressive achievements is the virtually universal acceptance, and the support the EITI has mobilised from the international community, private sector and civil society.”</p> <p>Information does not necessarily improve governance: However, increased information has not necessarily led to improved accountability (see Nigeria) – in particular, multiple studies have found that, although reports were completed, they were piggybacking on pre-existent reforms.</p> <p>Misaligned incentives: Once compliance has been reached, “international reputation” is no longer at stake and the “chance of delisting is very low, since the EITI is eager to increase institutional success through increasing compliant country numbers” (see unintended consequences).</p> <p>There has been a lack of adoption by many of the most resource-rich (and corrupt) countries, and institutional adoption is mostly driven by</p>	<p>common denominator. Further, the EITI International Secretariat has argued that it is “more important for the stakeholders to agree on smaller, actionable issues, than to aim for large overarching long-term goals that might seem unachievable”</p> <p>Lack of resources to implement: Many of the implementing countries lack both the human and financial capacity to implement the EITI requirements, and to produce the information within the stipulated timeframes and disseminate it effectively, in a comprehensible manner to the wider public.</p> <p>Unintended consequences:</p> <p>a) Transparency should not be the only goal, as it does not necessarily improve resource-dependent economic growth. At the very least, “the effectiveness of improving transparency should be more systematically evaluated vis-à-vis other policy options”.</p> <p>b) Voluntary initiative may have detracted from mandatory ones, with EITI providing an argument to those opposed to mandatory that a “constructive”, voluntary, and tripartite approach was best suited and already existing. As such, EITI may have delayed these processes, notably by focusing the attention of the policy community on this voluntary initiative and “softening” the position of civil society organizations’.</p>
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¹⁶⁸ The Dodd-Frank Act repealed section 1504, for the petroleum industry, in 2017 – see Mitro T, Farewell Dodd-Frank. Sometimes We Don’t Like What Makes Us Stronger, Forbes, 17 Feb 2017, cited 8 Mar 2018, available from: <https://www.forbes.com/sites/uhenergy/2017/02/17/farewell-dodd-frank-sometimes-we-dont-like-what-makes-us-stronger/#40f5d8293c4e>

						incentives or external pressures – such as foreign aid dependence or the need for diplomatic and security support. There are factors that would have little influence over some of the oil-rich countries “in need” of the EITA. ¹⁶⁹	
<i>Self-Regulation</i>							
Code of Pharmaceutical Marketing Practices, International Federation of Pharmaceutical Manufacturers and Associates (IFPMA) ¹⁷⁰	Members of IFPMA and (to some extent) the World Health Organization (WHO) , having suggested that “industry should solve a range of international problems”.	The Code, first enacted in 1981, was “taken after more than a decade’s public and professional discussion and after less stringent ethical and scientific standards had been adopted in 1968 through the WHO”. Subsequently, the WHO admitted that “public regulation was not possible or, at least, could not be the exclusive instrument of regulation”. As such, the Code tried to establish sanctions through adverse publicity and clearer identification and accountability of firms.	The Code is a binding requirement of IFPMA membership . Operationalised in 1995, it emphasises the “ principle of self-audit, through individual firms ”. Article 3 requires all member associations and companies to adhere, which means that the promotion of any medicinal product, anywhere in the world, by any company that is a member of an IFPMA member association, must be in accordance with the provision of the Code, including: a) provisions on clinical research and transparency; b) fees for services; c) support for continuing medical education; d) interactions with patient organizations, training; and,	Continuous monitoring and external sanctioning occurs at the national association level, and the IFPMA publishes periodic status reports on complaints received under the Code. It circulates these complaints to national drug regulatory agencies and international organizations. Barriers to implementation: a) lack of administrative capacity in developing governments; b) the lack of national associations with a capacity to implement the Code and, if necessary, impose prompt and effective sanctions, either alone or in concert with	IFPMA member associations managed alleged breaches occurring in their respective national territories under their own respective codes. No national code: Companies fall within the scope of the IFPMA Code when they occur in countries where there is no national code, appropriate laws and regulations, or where a member company is not a member of a local/regional association.	If the Code is found to have been breached, IFPMA will publish the name of the company concerned and its offences. Information may also be made public in cases where a company fails to respond within a specific time. Reports of “malpractice have damaging effects on both the patients and the professional status of those responsible for prescribing drugs. Repercussions for the image of all pharmaceutical procedures, irrespective of their own marketing, would likely follow”.	Shadow of hierarchy: Seen from the industry’s perspective at that time, an important aim was to avoid the more imminent threat of public regulation at the international level and to avoid, therefore, surrendering the issue unconditionally to the WHO. In other words, the key purpose of self-regulation was at this stage to avoid multilateral regulation. Voluntary network limits global coverage: Despite seeking global coverage, the IFPMA itself is not in a position to fully monitor the degree of compliance worldwide. Instead, it relies primarily on the information provided by member associations and individual companies – “membership is strongly biased towards industrialised countries...[T]his discrepancy between intended and actual coverage by self-regulatory mechanisms is a perennial problem, although there have been

¹⁶⁹ David-Barrett, E., Okamura, K., 2016. Norm diffusion and reputation: the rise of the extractive industries transparency initiative. *Governance* 29, 227–246.

<http://dx.doi.org/10.1111/gove.12163>

¹⁷⁰ Franer J, Izquierdo JZ, Music T, Narsai K, Nikidis C, Simmonds H, Woods P. Ethical pharmaceutical promotion and communications worldwide: codes and regulations. *Philosophy, Ethics, and Humanities in Medicine*. 2014 Dec;9(1):7 and Code of Practice, International Federation of Pharmaceutical Manufacturers & Associations, available from: <https://www.ifpma.org/subtopics/code-of-practice-2/> and Ronit K, Schneider V. Global governance through private organizations. *Governance*. 1999 Jul 1;12(3):243-66.

			<p>e) additional information on how complaints should be handled.</p> <p>Subsidiary: respective national territories can apply their own codes, which must reflect the IFMPA code at a baseline minimum but may contain more stringent provisions. It is then up to individual companies to interpret and translate the Code more “concretely into patterns of ethical behaviour”.</p>	local agencies.			successful attempts to apply and strengthen self-regulation in regional and national contexts”.
<p>Collective Asset Clauses (CACs) in International Bonds and an International Code of Conduct for Sovereign Debt Restructuring¹⁷¹</p>	<p>CACs: Leading sovereign debtors, private financial actors, and creditor governments – particularly US treasury officials* (where the process of regulatory change was initiated by a set of crises – the international financial crises of 1994 and 1997-98 – that demonstrated the costs associated with the existing bailout model of handling sovereign debt crises).</p> <p>The first move was a unilateral decision of the Mexican government in February 2003 to issue a</p>	<p>The alternatives to the discredited “bailouts” included either:</p> <p>a) a statutory mechanism, known as Sovereign Debt Restructuring Mechanism (SDRM), or</p> <p>b) a market-based, contractual method (CACs and Code of Conduct).</p> <p>The IMF proposed the (SDRM), where a sovereign debtor, facing the prospect of defaulting, could request that the IMF endorse a standstill on payments. The debtor would be required to</p>	<p>The rapid spread of CAC bonds resulted from the combination of the unilateral decisions of debtor governments to issue them and the embrace of these bonds by private creditor interests designed to facilitate a more orderly restructuring of unsustainable sovereign bond debt owed to foreign private creditors, by allowing for such things as: a) debtor-initiated restructuring and payments suspension;</p> <p>b) the collective representation of creditors in a crisis;</p> <p>c) qualified majority voting by bondholders to alter terms and conditions of bond contractors; and</p> <p>d) restrictions on the ability of individual creditors to sue debtors or demand full</p>	IMF has engaged in annual country and multilateral surveillance efforts .	<p>Code of Conduct: The IFF and Northern banks, rather than acting as regulators, serve more as coordinators “in the building of voluntarist public-private hybrid networked form of governance”. In December 2005, they began publicly evaluating the extent to which emerging market governments were complying with the Principles in areas such as investor relations and information sharing.</p>	<p>At the end of 2002, only 30% of sovereign bonds issues by emerging markets had CACs, and most had been issued in London. By 2004, close to 90% of new international bond issues had CACs, and the figure had approached close to 100% by 2005.</p>	<p>Shadow of hierarchy: Although private sector actors and debtor governments played important roles in establishing the new patterns of global regulation, their initiatives emerged very much within the “shadow” of dominant states and bodies, especially the United States and the IMF, who were noting that attention should be given to the idea of an international bankruptcy law for sovereign debtors – “we need an agreement on international bankruptcy law so that we can work with governments that, in effect, need to go through a Chapter 11 reorganization instead of socialising the costs of bad decisions”. Indeed, many analysts have noted that the US and G-7 seemed to be deliberately keeping the SDRM proposal on the table until early 2003 as a way of “prompting private financial interests to accept CACS”.</p>

* The Role of US Treasury is worth noting, as they explicitly encouraged “developing countries to begin to issue CAC bonds by lobbying borrowers and investors...and encouraging the IMF to begin to promote the issue of CACs in annual country and multilateral surveillance efforts” and “engaged in some intense direct lobbying of developing-country governments”.

¹⁷¹ Helleiner E, Filling a Hole in Global Financial Governance? The Politics of Regulating Sovereign Debt Restructuring in Mattli, W., & Woods, N. (Eds.). (2009). The politics of global regulation. Princeton University Press and In Whose Benefit? Explaining Regulatory Change in Global Politics, Mattli W and Woods N., in Mattli, W., & Woods, N. (Eds.). (2009). The politics of global regulation. Princeton University Press

	<p>bond in New York with CACs.</p> <p>Code of Conduct: the IMF and World Bank were initially involved, however, discussions were restricted to a narrower dialogue between a small group of private financial interests – primarily the IIF and International Primary Market Association (which represented debt underwriters) – and emerging market governments – particularly Mexico, Brazil, Turkey and Korea.</p>	<p>introduce sound economic policies and negotiate debt restructuring in good faith with its creditors.</p> <p>Code of Conduct: The IIF developed an international conduct for debt restructuring, “shifting the terms of the international debate on bond restructuring mechanisms onto terms that were friendlier to private creditor interests”. The IFF suggested that, “[i]nstead of constructing a new international institution, this initiative is cultivating a more informal, networked form of governance”</p> <p>Other options discussed at the 1995 Hifax Summit included:</p> <ul style="list-style-type: none"> a) turning IMF from a lender-of-last-resort into an international bankruptcy court; b) developing an IMF-led international bankruptcy mechanism which would have enabled debtors to initiate payments standstill and stay on litigation until an “international debt adjustment facility” back a restructuring plan. 	<p>repayment.</p> <p>CACS only applied to new bonds being issued, leaving many of the key decisions concerning debt restructuring in the hands of the private creditors, rather than allocating them to an independent arbiter, or sharing power more equally with sovereign debtors in a formal institutional setting.</p> <p>Code of Conduct: the voluntary code endorsed by the leading representatives of the international private financial community and public authorities in both emerging markets and creditor countries, allowing for:</p> <ul style="list-style-type: none"> a) information sharing and transparency; b) close debtor-creditor dialogue and cooperation; c) good faith actions in debt restricting; and d) equal treatment of all investors in case of defaults. 		<p>In March 2006, the IIF also established a “Group of Trustees” to review the implementation, and possible further development of the Principles.</p>		<p>Role of crisis: Analysis has shown that the move toward regulating sovereign debt restricting was driven by an international crisis that symbolised in a “visible and dramatic way how international financial policy making had been increasingly captured by the interests of private creditors”, as “moral hazard became ranked as a much higher concern and one which the old model could not adequately deal with”</p> <p>Challenges facing statutory regulation: Private creditors emerged as strong critics to SDRM because:</p> <ul style="list-style-type: none"> a) the SDRM could override contract provisions and restrict creditors freedom by imposing standstill and/or restrictions on the freedom to litigate; and b) the SDRM would bolster sovereign debtors bargaining position during restricting negotiations. <p>Ultimately, the SDRM proposal was seen as overly bureaucratic solution that would give the IMF too much power. As a result, the preference was for the more decentralised, market-oriented solution offered by the CACs and Code of Conduct.</p>
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Appendix 6 – Including AMR in the SDGs

Table 4: SDG indicators that could be used to monitor progress on animal consumption of antimicrobials

Goal	Target	Indicators	Custodial Agency	Partner Agency	Tier Classification ¹⁷²
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	2.4.1 Proportion of agricultural area under productive and sustainable agriculture	FAO	UNEP	Tier 3, with IAEG-SDG 6th meeting: Review of results of pilot studies necessary and more testing needed before indicator can be reclassified
Goal 12. Ensure sustainable consumption and production patterns	12.1 Implement the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	12.1.1 Number of countries with sustainable consumption and production (SCP) national action plans or SCP mainstreamed as a priority or a target into national policies	UNEP	n/a	Tier 2, Reviewed at 6th IAEG-SDG meeting (classified as Tier II)

Table 5: Animal relevant indicators critical for the achievement of the SDGs

Goal	Target	Indicators	Custodial Agency	Partner Agency	Tier Classification
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	2.3.1 Volume of production per labour unit by classes of farming/pastoral/f forestry enterprise size	FAO	n/a	Tier 3, IAEG-SDG 6th meeting: Needs additional work on definition of "small scale food producers"
Goal 2. End hunger, achieve food security and improved	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase	2.4.1 Proportion of agricultural area under productive and	FAO	UNEP	Tier 3, IAEG-SDG 6th meeting: Review of results of pilot studies necessary and

¹⁷² IAEG-SDGs – Tier Classification for Global SDG Indicators, as of the 15th of December 2017

- To facilitate the implementation of the global indicator framework, all indicators are classified by the IAEG-SDGs into three tiers on the basis of their level of methodological development and the availability of data at the global level, as follows: Tier Classification Criteria/Definitions:
 - Tier 1: Indicator is conceptually clear, has an internationally established methodology and standards are available, and data are regularly produced by countries for at least 50 per cent of countries and of the population in every region where the indicator is relevant:
 - Tier 2: Indicator is conceptually clear, has an internationally established methodology and standards are available, but data are not regularly produced by countries:
 - Tier 3: No internationally established methodology or standards are yet available for the indicator, but methodology/standards are being (or will be) developed or tested.

Available from: <https://unstats.un.org/sdgs/iaeg-sdgs/tier-classification/>

nutrition and promote sustainable agriculture	productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	sustainable agriculture			more testing needed before indicator can be reclassified
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development	14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism	14.7.1 Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries	FAO, UNEP-WCMC	n/a	Tier 3

Other places where mutual progress can be made in achieving SDGs and mitigating AMR exist where the operationalization of loosely defined indicators allows for adjustments. For instance, SDG 17 – ‘Sustainable Knowledge Development’ offers numerous opportunities to articulate with AMR through targets and indicators focused on: producing science and technology agreements; enhancing policy coherence of sustainable development; improving reporting, monitoring, and sharing of knowledge; and enhancing capacity-building support for resource-constrained countries.¹⁷³

Table 6: SDG 17 opportunities for articulation with AMR¹⁷⁴

Goal	Target	Indicators	Custodial Agency	Partner Agency	Tier Classification
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation and enhance knowledge-sharing on mutually agreed terms, including through improved coordination among existing mechanisms, in particular at the United Nations level, and through a global technology facilitation mechanism	17.6.1 Number of science and/or technology cooperation agreements and programmes between countries, by type of cooperation	UNESCO -UIS (Possible)	n/a	Tier 3
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for	17.14 Enhance policy coherence for sustainable development	17.14.1 Number of countries with mechanisms in place to enhance policy coherence of	UNEP	n/a	Tier 3

¹⁷³ Jasovský, D., Littmann, J., Zorzet, A. & Cars, O. (2016). Antimicrobial resistance—a threat to the world’s sustainable development. *Upsala Journal of Medical Sciences*. 121(3), 159-164. doi: 10.1080/03009734.2016.1195900.

¹⁷⁴ Tier Classification for Global SDG Indicators, United Nations Statistics Division, Statistical Services Branch, New York, 15 Dec 2017 [cited on 10 Apr 2018] available from: https://unstats.un.org/sdgs/files/Tier%20Classification%20of%20SDG%20Indicators_15%20Dec%202017_web%20final.pdf

Sustainable Development		sustainable development			
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	17.16 Enhance the Global Partnership for Sustainable Development, complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources, to support the achievement of the Sustainable Development Goals in all countries, in particular developing countries	17.16.1 Number of countries reporting progress in multi-stakeholder development effectiveness monitoring frameworks that support the achievement of the sustainable development goals	OECD, UNDP	UNEP	Tier 2
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	17.18 By 2020, enhance capacity-building support to developing countries, including for least developed countries and small island developing States, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts	17.18.1 Proportion of sustainable development indicators produced at the national level with full disaggregation when relevant to the target, in accordance with the Fundamental Principles of Official Statistics	UNSD	UNEP, UNFPA	Tier 3

Appendix 7 – Global governance platforms and key lessons

Platforms	Category	Founding date	Description and key founding objectives	Site of platform	Reporting responsibility	Funding sources	Select lessons for global governance
United Nations Interagency Task Force on NCDs (UNIATF) ^{175,176,177}	UN task force	2013	Established by the UN Secretary-General, the Task Force aims to coordinate UN body action – of over 40 UN agencies, the World Bank, and other regional development banks – in efforts to tackle non-communicable diseases (NCDs). The Task Force aims to: <ul style="list-style-type: none"> ▪ coordinate activities of relevant UN funds, agencies, and programs on NCDs; ▪ support Member States on NCD action when requested; ▪ facilitate NCD-related information exchanges and knowledge sharing among the UN network; ▪ strengthen advocacy on NCDs on various international development agendas; ▪ incorporate the work of the Ad Hoc Inter-Agency Task Force on Tobacco Control; and ▪ strengthen international cooperation and the exchange of best practices on the prevention and control of NCDs. 	Established by the UN Secretary-General and convened and led by the World Health Organization (WHO) which provides the Secretariat for the Task Force.	Secretariat, formed under WHO, reports to the Economic and Social Council (ECOSOC) through the Secretary-General, incorporating the work of the Ad Hoc Inter-Agency Task Force on Tobacco Control.	Not publicly available.	<p>Conducting joint programming missions to achieve specific aims at a country level. The UNIATF engages in programming missions to support Member States requesting assistance for NCD action. Numerous examples of successful missions with key outcomes have already been noted in a variety of countries including implementation of sugar taxation in Barbados, incorporation of NCDs into national priorities in Kyrgyzstan, and mainstreaming tobacco control policies in Zambia.</p> <p>Coordinating action on a key issue that sits across UN agency agendas. The UNIATF is able to convene parties and members across the UN to both prioritize NCD policies but also translate that into action in a cooperative manner creating impact at an international, regional, and national level.</p> <p>Limiting governance to UN and regional banks, but including non-State actors in joint programming. The UNIATF chooses to govern its action solely through the work of UN agencies and related partners, but executes its action through joint partnerships with non-State actors such as NGOs, the private sector, philanthropic groups, and academic institutions.</p>
Sustainable Energy for All (SEforALL) ^{178,179,180}	UN initiative, quasi-international	2011	SEforALL was established by the UN Secretary-General with the purpose of envisioning a future of sustainable energy and with a mandate to work towards that vision through a multi-stakeholder	Established by the UN Secretary-General	Operates as a quasi-international organization reporting to an	Relies on donor contributions from Denmark, Germany, Iceland,	<p>Bringing together multiple stakeholders in a quasi-international organization. SEforALL attempts to bring together governments, private sector members, investors, civil society, and banks in an equal manner to push action on a specific, critical SDG.</p>

¹⁷⁵ UN Interagency Task Force on NCDs (UNIATF). (2018). Available from: [http://www.who.int/ncds/un-task-force/en/\(site and its subsidiary branches\)](http://www.who.int/ncds/un-task-force/en/(site and its subsidiary branches)). [Accessed 18 May 2018].

¹⁷⁶ World Health Organization. (2017). *Working together for health and development*. World Health Organization. Available from: <http://www.who.int/ncds/un-task-force/working-together-adaptation.pdf?ua=1> [Accessed 18 May 2018].

¹⁷⁷ World Health Organization. (n.d.). *Terms of reference for the UN Interagency Task Force on the prevention and control of noncommunicable diseases*. World Health Organization. Available from: http://www.who.int/ncds/un-task-force/ToR_UNIATF.pdf?ua=1 [Accessed 18 May 2018].

¹⁷⁸ Sustainable Energy For All. (n.d.). Available from: [https://www.seforall.org/\(site and its subsidiary branches\)](https://www.seforall.org/(site and its subsidiary branches)). [Accessed 18 May 2018].

¹⁷⁹ KPMG. (2018). Sustainable energy for all. *Report on the audit of the financial statements for the financial year ended 31 December 2017*. KPMG. Available from: https://www.seforall.org/sites/default/files/Sustainable-Energy-for-All_fin17.pdf [Accessed 18 May 2018].

¹⁸⁰ Sustainable Energy for All. (2016). *Going further, faster – together*. Sustainable Energy for All. Available from: https://www.seforall.org/sites/default/files/2016_EUSEW.pdf [Accessed 18 May 2018].

	organization		<p>approach that took both poverty and climate change into consideration. Since 2016, it has focused its aims around Sustainable Development Goal (SDG) 7 – which calls for universal access to sustainable energy by 2030 – with the following objectives:</p> <ul style="list-style-type: none"> ensuring universal access to modern energy services; doubling the share of renewable energy in the global energy mix; and doubling the global rate of improvement in energy efficiency. 	operating under an CEO and Special Representative of the UN Secretary-General. Housed in Vienna and Washington.	Administrative Board – made of private sector, civil society, and government members. Reports also to the CEO and Special Representative of the UN Secretary-General.	Sweden, the UK, and non-profit organizations valued at over 12 million USD in 2016 distributed to its participating organizations in the same year (Executive Office of the Secretary General, United Nations Development Program, United Nations Industrial Development Organization, and United Nations Office for Project Services).	<p>It does so through facilitative informal and formal partnerships – such as Regional and Thematic Hubs, Advisory Committees, and High Impact Opportunities – that can drive action flexibly and contextually while bringing in stakeholders where needed. Its special status as a quasi-organization will allow it to set out a governance structure that maintains UN engagement but also gives full participation to State and non-State actors.</p> <p>Utilizing a process involving assessment through to action. SEforALL conducts rapid assessments and gap analyses at the national level, providing clarity on what action is needed and how it can be achieved, and then works to finalize agendas for action to tailor an approach for change to the national context. SEforALL also has its own method of monitoring progress toward its goals made possible through a Global Tracking Framework formed by the International Energy Agency, the World Bank, and other coalition partners – this framework is now also supporting the UN’s development of indicators for measuring progress toward achievement of SDG 7.</p>
Every Woman Every Child (EWEC) 181,182,183,184	UN initiative	2010	<p>Launched by UN Secretary-General Ban Ki-moon, EWEC is a UN-based initiative aiming to save and improve the lives among hundreds of millions of women and children globally through a collaborative global movement attempting to mobilize multiple stakeholders to take action.</p> <p>The initiative began with an initial strategy in 2010 interlinked with the MDG agenda that has been expanded with a follow-on strategy through to 2030 aligned with the SDG agenda. Its objectives are:</p> <ul style="list-style-type: none"> survive – to end preventable deaths; thrive – to ensure health and well-being; and transform – to expand enabling environments for women and children. 	Initiative of the UN Secretary-General, integrally tied to the H6 Partnership involving different UN organisations.	<p>High-Level Steering Group – made of government, private sector, civil society and philanthropic representation - reports to the UN-Secretary General.</p> <p>Work has also been assessed by an Independent Accountability Panel (IAP) whose work is then under</p>	<p>Funded by governments, CSOs and NGOs, the private sector, joint commitments, philanthropic and funding organisations, healthcare workers and professionals, and UN and multilateral organisations.</p> <p>As of 2017, \$45 billion USD had been disbursed by</p>	<p>Synergizing an initiative launch with a global gathering. The launch of the initiative at the UN MDG Summit, which was synergistically linked with the agenda of discussion, allowed for a space for UN legitimacy, advocacy, immediate global commitments, and globally centred attention on the initiative within a short time period. The launch took advantage of the financial, political, and social environment of the event enabling the success of the launch.</p> <p>Developing a strong source of funds through sustained voluntary commitments. More than \$40 billion was pledged by parties and partners at the launch allowing for increased credibility, a reliable source of funds for action, and secured buy-in from investment partners that could contribute to the future success of the initiative. Momentum and commitments have been maintained since – as of 2016, 46 billion USD had been disbursed to EWEC and its Global Strategy, with some 20 billion USD further pledged.</p>

¹⁸¹ Every Woman Every Child. (2016). Available from: www.everywomaneverychild.org/ (site and its subsidiary branches). [Accessed 8 May 2018].

¹⁸² Every Woman Every Child. (n.d.). *Every Woman Every Child*. Available from: www.un.org/millenniumgoals/pdf/EveryWomanEveryChild.pdf [Accessed 8 May 2018].

¹⁸³ Every Woman Every Child. (n.d.). *The unified accountability framework: supporting country-led efforts with the Global Strategy for Women’s Children’s and Adolescents’ Health*. Available from: <http://www.everywomaneverychild.org/wp-content/uploads/2016/12/UAF-2-pager.pdf> [Accessed 8 May 2018].

¹⁸⁴ Every Woman Every Child. (2017). *Progress in partnership: 2017 progress report on the Every Woman Every Child Global Strategy for Women’s, Children’s and Adolescent’s Health*. World Health Organization. Report number: WHO/FWC/NMC/17.3. Available from: <http://gsprogressreport.everywomaneverychild.org/wp-content/uploads/2017/07/GS-update-2017.pdf> [Accessed 8 May 2018].

					review by the High Level Political Forum for the Sustainable Development Goals and the World Health Assembly.	various partners to EWEC. A Global Financing Facility (GFF) for EWEC, hosted by the World Bank, now exists to prioritize issues, coordinate financing, and track progress and learning through country leadership.	A small portion of funds are transmitted through the GFF, due to the nature of open commitments, not all disbursements route through the GFF allowing for multiple funding routing options. Commitments to EWEC can be made through stakeholders that are financial, in-kind, or through non-financial means mostly from governments, the private sector, and civil society and nongovernmental organizations in that order. There is annual reporting on multi-stakeholder commitments and a global progress report presented at WHA. Innovatively engaging multiple stakeholders. EWEC mobilizes action and commitment from many stakeholders – international and national government agencies, multilaterals, the private sector, and civil society – and involves them in its leadership allowing for cooperation in achieving its aims, platforms for connected action, and the inclusion of a diversity of interests in its work.
Scaling Up Nutrition (SUN) 185,186,187,188	Movement	2010	The Scaling Up Nutrition Movement seeks to end malnutrition in all its forms and to improve nutrition worldwide through a collaborative multi-stakeholder process.	Secretariat formally situated in the UN Office for Project Services with the Lead Group (supported by a Secretariat and Coordinator) operating under the auspices of the UN Secretary-General.	The Secretariat and Coordinator operate under the Lead Group (made of government, private sector, civil society and philanthropic representation), which itself operates under the UN Secretary-General. Individual SUN Countries report progress to the Lead Group on an annual basis.	Funded by independent country-raised resources for their respective work with the SUN Secretariat and Coordinator funded by select governments (EU, Canada, France, Germany, and Ireland) and The Bill and Melinda Gates Foundation. The Secretariat budget in 2016 was just over 5 million USD.	Having a small Secretariat located in the UN with links to the UN Secretary-General. SUN is a UN-recognized leadership body under observation by the Secretary-General allowing it to conduct its work in a legitimate way recognized by various Member States. Reporting country-level progress on an annual basis through a collaborative assessment mechanism. Joint assessments are conducted annually in SUN countries through a participatory process between in-country stakeholders, including government, in partnership with members from civil society, academia, donors, UN agencies, and the private sector. Progress is assessed as per the SUN strategy, which was developed through a consultative process of 57 countries, UN and donor agencies, and hundreds of business and NGOs. Using country-driven commitments to drive support on nutrition. Through the SUN model, countries are able to drive their own commitments to a common strategy and roadmap on nutrition with support from the Secretariat creating an environment of autonomously directed and funded work that is contextually

¹⁸⁵ Scaling Up Nutrition. (2015). Available from: <http://scalingupnutrition.org/> (site and its subsidiary branches). [Accessed 8 May 2018].

¹⁸⁶ Isenman, P., Bezanson, K., & Gostelow, L. (2011). *Stewardship of the SUN movement: taking the SUN to the next level*. Available from: <http://docs.scalingupnutrition.org/wp-content/uploads/2016/11/Stewardship-Study-Final-Report.pdf> [Accessed 8 May 2018].

¹⁸⁷ Scaling Up Nutrition Secretariat. (2016). *Support to the Scaling Up Nutrition (SUN) movement Secretariat annual financial report of expenditures 1 January 2016 – 31 December 2016*. Scaling Up Nutrition Secretariat. Available from: http://docs.scalingupnutrition.org/wp-content/uploads/2016/06/170726_SMS-2016-Annual-Financial-Report.pdf [Accessed 8 May 2018].

¹⁸⁸ Scaling Up Nutrition Secretariat. (2016). *SUN movement strategy and roadmap (2016-2020)*. Scaling Up Nutrition Secretariat. Available from: http://docs.scalingupnutrition.org/wp-content/uploads/2016/09/SR_20160901_ENG_web_pages.pdf [Accessed 8 May 2018].

Global Sanitation Fund (GSF) 189,190,191	Fund	2008	The GSF was formed by the Water Supply & Sanitation Collaborative Council (WSSCC) to address the global sanitation and hygiene crisis. As the only global fund dedicated to sanitation and hygiene, it aims to support national and community-led sanitation and hygiene programmes through a multi-stakeholder approach to improve poor sanitation and hygiene conditions.	Hosted by UN Office for Project Services and operated by the WSSCC Secretariat.	Reports to the WSSCC Steering Committee – made of government and UN agency representatives and permanent non-voting individuals – and the GSF Advisory Committee – appointed by the WSSCC Executive Director.	Donor governments, including Australia, Finland, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom. The GSF budget in 2016 was over 26.3 million USD.	determined. Empowering community-led action through directed financing. The GSF provides funds to community-led projects and to national programmes to allow them to lead and contextualize work to their settings, thus allowing for effective tailored approaches that collectively solve a common problem but through different, locally-situated mediums.
Access to Medicines Foundation 192,193,194	Independent foundation	2003	The Access to Medicine Foundation aims to encourage pharmaceutical companies to take action to increase access to medicines in low- and middle-income countries. The Foundation: <ul style="list-style-type: none"> analyses pharmaceutical policies and practices; uses publicly ranked indexes – such as the Antimicrobial Resistance (AMR) Benchmark - to compare the world's largest 20 pharmaceutical companies across key areas of behaviour as well as vaccine companies and their support for unimmunised children; reports what companies are doing to bring antimicrobial resistance under control; and conducts other thematic studies on pharmaceutical company responses to access-to-medicine challenges. <p>To conduct its work, the organisation collects and analyses data from the largest pharmaceutical and vaccine companies while engaging with donors,</p>	Netherlands-based independent, non-profit registered charity.	Reports to its Supervisory Board, which is independent from the Foundation Executive.	Funded by governments and development organisations, such as the UK Government, the Dutch Ministry of Foreign Affairs, and The Bill and Melinda Gates Foundation. Its 2016 budget was nearly 1.4 million USD with a general reserve of just over 4000 USD.	Starting with multi-stakeholder consensus. The Foundation's tri-pronged process for driving change begins with consensus-building among stakeholders – including specialists from multilaterals, governmental and NGOs, the pharmaceutical industry, patient organisations, and other investors – followed by the stimulation of competition on agreed upon health priorities and the sharing of best practice. This process for achieving general agreement prior to action allows the Foundation to provide common standards with assured buy-in from involved parties. Enabling collaborative competition to stimulate a “race to do well”. The Foundation stimulates competition to achieve common objectives among the largest pharmaceutical companies by publicly ranking their success across agreed upon metrics, which are built upon stakeholder consensus allowing for the integration of multiple perspectives in measurement metrics. While this occurs for specific desirable behaviours of organisations, the approach is being used for a separate Antimicrobial Resistance Benchmark, which will not only channel stakeholder activity but also serve as a mechanism for

¹⁸⁹ Global Sanitation Fund. (2015). *2015 progress report*. Global Sanitation Fund. Available from: <https://www.wsscc.org/wp-content/uploads/2016/07/Global-Sanitation-Fund-Progress-Report-2015-WSSCC.pdf> [Accessed 8 May 2018].

¹⁹⁰ Water Supply & Sanitation Collaborative Council. (2016). Available from: <https://www.wsscc.org/> (site and its subsidiary branches) [Accessed 8 May 2018].

¹⁹¹ Water Supply & Sanitation Collaborative Council. (2016). *Annual report 2016*. Water Supply & Sanitation Collaborative Council. (2016). Available from: <https://www.wsscc.org/wp-content/uploads/2017/09/WSSCC-Annual-Report-2016.pdf> [Accessed 8 May 2018].

¹⁹² Access to Medicine Foundation. (2016). Available from: <https://accesstomedicinefoundation.org/> (site and its subsidiary branches). [Accessed 8 May 2018].

¹⁹³ Iyer, J.K. & Mendelson, M. (2017). Can the antimicrobial resistance benchmark blaze a new trail? *Lancet*, 390, 2334-2335. doi: 10.1016/S0140-6736(17)32670-3.

¹⁹⁴ Access to Medicine Foundation. (2016). *Access to Medicine Foundation annual report*. Access to Medicine Foundation. Available from: https://accesstomedicinefoundation.org/media/atmf/Access-to-Medicine-Foundation_Annual-Report-2016.pdf [Accessed 8 May 2018].

			civil society, government, and the private sector to translate findings to action.				the industry to assess progress, create collaborative competition, and incentivize action through a non-financial mechanism.
UN-Water ^{195,196}	UN coordination mechanism	2003	<p>UN-Water aims to coordinate UN entity and international organization efforts on water and sanitation. They support Member State activities by:</p> <ul style="list-style-type: none"> ▪ creating and informing policies in international agendas; ▪ providing data on water trends and management issues in a coordinated and credible manner; ▪ reporting on global progress through various mediums; and ▪ advocating for water and sanitation issues. 	Established by the UN System Chief Executive Board for Coordination, operates as an independent coordination mechanism.	Has a Chair (nominated by UN Executive Heads in consultation with the UN System Chief Executives Board), a Vice-Chair elected among Members (sourced from international organizations, professional groups, UN institutions, and other civil society groups), and a Secretary that is a member of the United Nations Department of Economic and Social Affairs.	<p>UN-Water is funded by voluntary contributions from agencies wishing to support it. Current supporting agencies include governments (Switzerland, Sweden, Germany, The Netherlands, UK, France, and Italy) and the Bill and Melinda Gates Foundation. Money is placed into a trust fund administered by the United Nations Office for Project Services.</p> <p>Its 2016 end-of-year balance was over 1.4 million USD.</p>	<p>Providing monitoring information to policy-makers, decision-makers, and researchers to provide an evidence base for action. UN-Water uses various mediums to report the global state of water and sanitation – including a World Water Development Report and a Global Analysis and Assessment of Sanitation and Drinking Water (GLAAS) – while collaborating with other partners to do so, including UNICEF and UNESCO.</p> <p>Keeping a critical issue on the international agenda through persistent advocacy. UN-Water coordinates various activities to maintain the political salience of water and sanitation issues in the international arena. Activities include World Water Day, the World Water Development Report, and the the coordination of UN observances. They also advance action on water-related issues through presence and input at key political forums.</p>
UN Development Group (UNDG) ^{197,198}	UN forum	1997	<p>The UNDG is a high-level forum for policy formulation and joint decision-making within the UN system that aims to guide, support, and monitor coordination of development operations in 165 countries and territories. Its key objectives are to:</p> <ul style="list-style-type: none"> ▪ serve as a policy development and management instrument to support decision-making; ▪ contribute to strengthening policy coherence and cost-effectiveness of UN development 	Composed of with heads from numerous UN organisations, but operates under the auspices of the UNDG Chair (UN Deputy Secretary-General) on	Reports to the UNGA through ECOSOC.	Not publicly available.	<p>Strengthening policy coherence among sectors as well as a more unified UN presence at country level. The UNGA uses its power as a common body between nations to enable policy alignment globally, advance development through its provision of strategic direction, and encourage inter-agency action across the UN for cost-effectiveness and synergistic gains.</p> <p>Vertically integrating its global team with regional team action and contextualized coordination and implementation. By having a global forum for policy formulation and decision-making, regional teams with specific roles in driving strategic priorities, and</p>

¹⁹⁵ UN Water. (n.d.). Available from: [http://www.unwater.org/\(site and its subsidiary branches\)](http://www.unwater.org/(site and its subsidiary branches)) [Accessed 18 May 2018].

¹⁹⁶ UN-Water. (2016). *Annual Report 2016*. UN-Water. Available from: <http://www.unwater.org/publications/un-water-annual-report-2016/> [Accessed 18 May 2018].

¹⁹⁷ United Nations Development Group. (2016). Available from: [https://undg.org/\(site and its subsidiary branches\)](https://undg.org/(site and its subsidiary branches)) [Accessed 8 May 2018].

¹⁹⁸ United Nations Development Group. (2015). *United Nations Development Group (UNDG) functioning and working arrangements*. Available from: <https://undg.org/wp-content/uploads/2016/09/UNDG-Functioning-and-Working-Arrangements-3.1.pdf> [Accessed 8 May 2018].

			<p>operations;</p> <ul style="list-style-type: none"> provide a forum for consultations of UN heads of entities; promote a more unified UN presence at the country-level; serve as a key body for driving reform at a country level; and advocate the comparative advantages and results of a UN multilateral development cooperation. 	<p>behalf of the UN Secretary-General. Serves as a pillar of the UN Chief Executives Board.</p>			<p>resident coordinators and country teams responsible for implementation with clear working mechanisms, the UNDG is able to integrate its coordinated agenda setting collaboration with contextualized on-the-ground action through clear work processes.</p>
<p>Financial Action Task Force (FATF)^{199,200}</p>	<p>Independent task force</p>	<p>1989</p>	<p>Established by a G7 Summit in collaboration with the European Commission and 8 other countries, the FATF is an intergovernmental body with the main objectives of setting standards and promoting effective implementation of legal, regulatory, and operational measures for combating money laundering, terrorist financing, and other threats to the international financial system. In addition to constructing policy and recommendations that are recognised as international standards, they monitor the progress of their members in implementing measures as well as their vulnerabilities.</p>	<p>Led by a Secretariat that is situated within the OECD Headquarters in an administrative capacity, but remains a separate independent entity.</p>	<p>No specific oversight body to report to.</p>	<p>In 2016, the FATF has a budget of nearly 4.3 million USD.</p>	<p>Conducting research, setting global standards, and pushing implementation to protect against global risk. The FATF mobilizes a concerted effort to procure evidence and review current and future threats in terrorist financing, money laundering, and other areas that then results in policy recommendations for the global community and an organization-led push for implementation in all countries.</p> <p>Ensuring continued relevance through a time-bound, replenishing mandate. The FATF operates under a fixed term and requires a continued mandate from its Ministerial partners to continue its work. By doing so, it ensures its existence only so long as it is relevant both to its members and globally.</p>
<p>Intergovernmental Panel on Climate Change (IPCC)^{201,202,203,204}</p>	<p>UN body</p>	<p>1988</p>	<p>The IPCC is an international body responsible for assessing the science related to climate change. Its aim is to provide policymakers with regular assessments of the science behind climate change, its linkage with impact and future risk, and options for harm mitigation and adaptation.</p>	<p>Hosted by the World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP).</p>	<p>Reports to WMO and UNEP and to the IPCC Secretariat, which is hosted by UNEP, but its major reporting forum is at its plenary which occurs under the</p>	<p>Funded by regular contributions from WMO and UNEP, Member States, and the United Nations Framework Convention on Climate Change (UNFCCC).</p>	<p>Modeling how an intermediary body can expand policy options based on scientific evidence. The IPCC's role as a scientific assessment body facilitates its provision of rigorous and valid research findings to policymakers to expand policy options rather than advise a particular route. It is well-situated to do so through its UN-legitimized autonomous position situated between researchers and policymakers.</p> <p>Maintaining global representation. The broad membership of the IPCC and its inclusion of scientists from both resource-rich and</p>

¹⁹⁹ Financial Action Task Force. (2018). Available from: <http://www.fatf-gafi.org/> (site and its subsidiary branches) [Accessed 8 May 2018].

²⁰⁰ Financial Action Task Force. (2017). *Financial Action Task Force annual report 2015-2016*. Available from: <http://www.fatf-gafi.org/media/fatf/documents/reports/FATF-annual-report-2015-2016.pdf> [Accessed 8 May 2018].

²⁰¹ Intergovernmental Panel on Climate Change. (2018). Available from: <http://www.ipcc.ch/> (site and its subsidiary branches). [Accessed 8 May 2018].

²⁰² The Guardian. (2011). *What is the IPCC?* Available from: <https://www.theguardian.com/environment/2011/dec/06/what-is-ipcc> [Accessed 8 May 2018].

²⁰³ Yamineva, Y. (2014). *The governance of scientific assessment in the context of the Intergovernmental Panel on Climate Change*. Discussion paper No. 7. German Development Institute: Bonn. Available from: https://www.die-gdi.de/uploads/media/DP_7.2014.pdf [Accessed 8 May 2018].

²⁰⁴ Intergovernmental Panel on Climate Change Secretariat. (2018). *IPCC trust fund program and budget, Forty-seventh session of the IPCC, 13-16 March 2018, France. Paris*, Intergovernmental Panel on Climate Change. Available from: http://www.ipcc.ch/apps/eventmanager/documents/49/150120180711-p47_doc2_programme_and_budget.pdf [Accessed 8 May 2018].

					auspices of WMO/UNEP.	Its trust fund value in 2018 was nearly 7.7 million USD.	resource-constrained countries ensure legitimacy and appropriate representation of varied interests.
Committee on World Food Security (CFS) 205,206,207	UN forum	1974, reformed in 2009	CFS is an inclusive, international, and intergovernmental platform for stakeholders – including Member Countries, UN bodies, international organisations, the private sector, and civil society and NGOs – to work together to coordinate efforts to ensure food security and nutrition for all. It was initially set up as a forum for review and follow up of food security policies, but has since gained increased decision-making legitimacy.	Situated as a UN committee under the auspices of the ECOSOC and the UN General Assembly (UNGA) supported by the Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), and the World Food Programme (WFP).	Reports to the UNGA through the ECOSOC as well as to the FAO Conference.	Funded equally by FAO, IFAD, and WFP with additional funding from individual countries including Canada, European Union, Finland, France, Netherlands, Sudan, Switzerland, and The Bill and Melinda Gates Foundation. Its High Level Panel of Experts and Civil Society Mechanism are funded separately through voluntary contributions from nations. Its planned total budget for 2018 is 4.75 billion USD.	Using a multi-stakeholder institutional structure. By including various representatives as participants with the organisation, it enhances its decision-making quality, collective ownership of decisions, accountability, and transparency. It is the only UN intergovernmental forum where civil society and private sector associations have participation facilitated by autonomously developed coordination mechanisms. Inclusion of technical expertise and a preference for evidence-based action. A High Level Panel of Experts for Food Security and Nutrition (HLPE) advises the CFS allowing for existing research and knowledge to inform decision-making and policies. Linking multi-stakeholder consultation to decision-making. By being able to report to ECOSOC and the UNGA, the work of the Committee on World Food Security is able to gain a platform for knowledge-sharing that can inform policy outputs. It also has the potential to set policies that are evidence-based and representative of multiple stakeholders.

²⁰⁵ Committee on World Food Security. (n.d.). *Committee on World Food Security*. Food and Agricultural Organization. Available from: <http://www.fao.org/cfs/home> (site and its subsidiary branches) [Accessed 8 May 2018].

²⁰⁶ Committee on World Food Security. (n.d.). *Committee on World Food Security: a multi-stakeholder, evidence-based approach to policy making*. Committee on World Food Security. Available from: http://www.fao.org/fileadmin/templates/cfs/Docs1516/About/CFS_Multistakeholder_Approach.pdf [Accessed 8 May 2018].

²⁰⁷ Committee on World Food Security. (2017). *Committee on World Food Security, Forty-fourth session “Making a difference in food security and nutrition”, 9-13 October 2017, Italy*. Rome, Committee on World Food Security. Available from: <http://www.fao.org/3/a-mu246e.pdf> [Accessed 8 May 2018].